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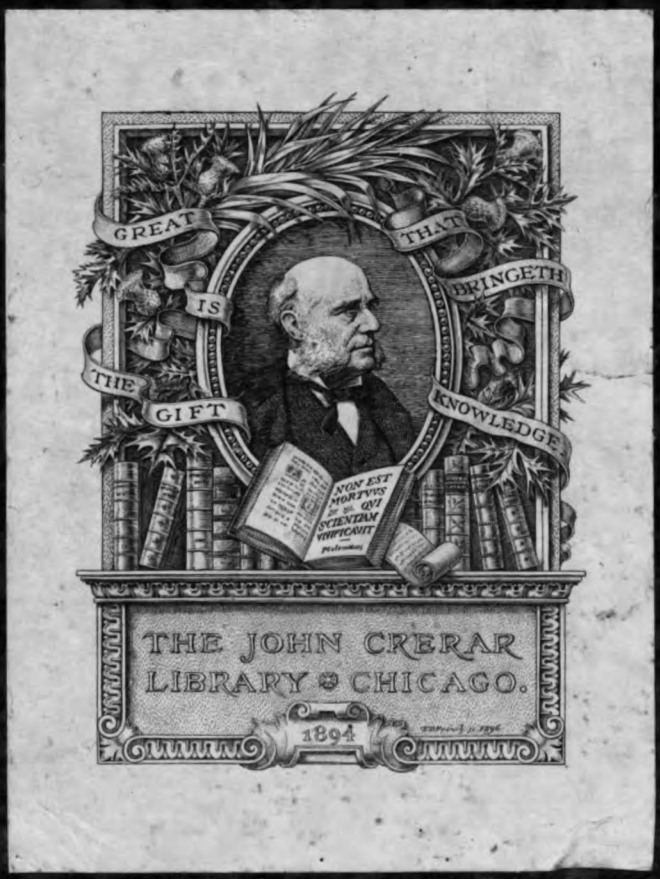

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THE JOURNAL

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CONTENTS.

PAGE.

The effect of Modern Projectiles against Battleships and Armoured Cruisers. By A. G. Hadcock, Esq., late R.A. 1
Concealed Positions for Field Artillery. By Col. F. D. V. Wing, C.B., R.F.A. 7
A method of ranging with Time Shrapnel, chiefly for use against Balloons and Searchlights. By Captain C. C. Noott, R.G.A. 10
Lines of Fire. By Captain H. G. Lloyd, R.F.A. 15
Slide-Rule Methods examined. By Capt. J. D. B. Fulton, R.F.A. 19
Siege Artillery Lessons from Port Arthur. (Written at the request of the Committee). By Colonel E. G. Nicolls, R.G.A. 25
Life and Recreation in Sierra Leone. By Captain C. E. Palmer, D.S.O., R.F.A. 41
Landings against Coast Fortresses and the rôle of Movable Armament. By Captain G. G. Thatcher, R.G.A. 45
The Sun as an Aiming Point. By Major A .L. Walker, R.F.A. 52
Artillery Patrols. By Lieut. J. A. Dane, R.F.A 53
Somaliland and its "Mad Mullah." By Captain A. A. McHardy, D.S.O., R.A. 57
Some remarks upon the early History and dates of formation of the Companies of Royal Artillery—1705-1757. By Major John H. Leslie, R.A., (Retired List). 65
A criticism on Captain Noott's suggested alteration in graduating Directors and Goniometric Sights. By Major P. de S. Burney, R.G.A. 68
The Capabilities of Mules as Transport Animals. By F. J. Dawson, Esq., M.I.C.E. 70
Experiences of the past, and their application to the present. (A Lecture delivered at the Royal Artillery Institution, Woolwich, on Thursday 14th February, 1907). By Colonel Lonsdale Hale. 73
A Corrector. By Lieut. G. W. V. Holdich, R.G.A. 86
Three weeks in Manchuria. By Captain T. M. Archdale, D.S.O., R.H.A. 90
The Training of Personnel for Ammunition Columns. By Major G. R. Talbot, Devon R.G.A. (M.), Captain R.A., (retired). 105
The application of Lieut.-Colonel A. ff. Powell's Rules for calculation of Angles of Sight, and Apex Angles, to Artillery in the Field. By Major J. G. Geddes, R.F.A. 110
Letter from Major Norman Ramsay, Horse Artillery. Communicated by Major E. C. Hawkshaw, R.A., (retired). 111
"Duncan" Gold Medal Essay, 1907. "To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations, and what rules should govern their tactical employment?" By Major H. S. Jeudwine, R.A. 113

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PAGE.

A Reply to Major Burney's criticism. By Captain C. C. Noott, R.G.A. 132
"Duncan" Silver Medal Essay, 1907. By Captain W. H. Moore, D.S.O., R.G.A. 133
" The Siege Operations at Langres, August—September, 1906." By Colonel H. C. C. D. Simpson, C.M.G., R.A. 145
Napoleon's Marshals. 1. Lannes. By Captain H. M. Davson, R.H.A. 169
Fighting Guns Landwards. By Major C. R. Buckle, D.S.O., R.G.A. 179
A Field Scale for Indirect Fire. By Captain H. W. Hill, R.F.A. 185
Hard Mouthed Horses. By Major J. F. N. Birch, R.H.A. 195
Notes on recent changes in the Japanese Field Artillery Manuals (Provisional). By Captain E. F. Calthrop, R.F.A. (Communicated by the War Office). 201
The Limit of Vision as applicable to short base rangefinder. By Major E. F. Hoblyn, R.A. 214
Some notes upon the origin, formation, and subsequent development of the Madras Horse Artillery, represented in the year 1907 by J, M, P, and R Batteries, Royal Horse Artillery. Compiled by Major J. H. Leslie, R.A., (retired list). 217
The Defence of a Temporary Naval Base. (An abridgement of a Lecture given at Devonport, February, 1907). By Captain A. E. C. Myers, R.G.A. 226
The Austrian Q.F. Field Gun. (1905 pattern). By Lieut.-Col. H. A. Bethell, R.F.A. 233
Choice of Positions for Artillery in the Field. By Colonel F. G. Stone, *psc.*, R.G.A. 238
The Orlnance College, Woolwich. By Colonel G. R. Townshend, R.A., (Commandant Ordnance College). 244
Firing over Friendly Infantry. By Lieut.-Colonel R. G. Strange, R.F.A. 249
A method of employing two limbers as an Observing Station. By Captain C. N. Buzzard, R.G.A. 251
Methods of estimating " Displacement," and for reckoning "Displacement Differences" for Artillery in the Field. By Major J. G. Geddes, R.F.A. 253
Remarks on Captain J. A. FitzGibbon's paper on " The Royal Artillery in the Siege of Gibraltar, 1779-1783." 260
A Combined Observation Ladder and Director. By Captain H. E. Molesworth, R.G.A. 263
Corrigenda to " R.A. Journal," Nos. 4 and 5, Vol. XXXIV. ... 264
To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations. and what rules should govern their tactical employment? "Duncan" Commended Essay, 1907. By Major K. K. Knapp, R.G.A. 265
"Duncan" Commended Essay, 1907. By Capt. O. L. Price, R.G.A. 280
The Training of Siege Artillery. By Capt. C. N. Buzzard, R.G.A. 297

Digitized by Google

PAGE.

The Counter-Attack. By Captain C. C. Robertson, R.F.A. (With two sketch maps). 303
A suggested system of ranging Howitzers from a standard of yards instead of a standard of degrees. By Colonel S. W. Lane, R.F.A. 312
The British Artillery at Waterloo, June 18, 1815. By Captain A. F. Becke, late R.F.A. (With map and three diagrams). 313
The Artillery under the provisions of The Territorial and Reserve Forces Bill, 1907. By Colonel H. C. C. D. Simpson, C.M.G., R.G.A. 329
A Senior Officers' Course at Hythe. By Colonel A. J. Abdy, R.A. 335
On the method of carrying out practice in a service company of Royal Garrison Artillery. By Major C. P. Martel, R.G.A. 339
A reply to Colonel F. G. Stone's paper on "Choice of Positions for Artillery in the Field." By Major J. F. Cadell, R.A. ... 347
Overland to Japan. By Major & Bt. Lt.-Col. R. W. Boger, R.A. 351
Makeshift method of entraining Field Artillery. By Q.M.S. Instructor in Gunnery T. Brady, R.G.A. (Communicated by Major T. H. Crozier, R.A.). 359
Notes on the Tactical Employment of Artillery in Enclosed and Wooded Country. By Major H. C. Williams-Wynn, R.F.A. 363
Firing over Friendly Infantry. By Captain N. E. B. Bellairs, R.A. 368
The need of a "One-Man" rangefinder for Field Artillery. By Lieut. L. St. J. R. Clutterbuck, R.F.A. 370
Pointed Bullets. By Captain J. H .Hardcastle, *pac.*, (late) R.A. 377
"To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations, and what rules should govern their tactical employment?" "Duncan" Commended Essay, 1907. By Major T. B. Wood, R.G.A. 393
The Value of Coast Fortresses. By Lieut. H. G. de Watteville, R.A. 411
Recent Changes in the Royal Regiment of Artillery. By Major J. H. Leslie, Royal Artillery, (Retired List). 421
Napoleon's Marshals. 2. Davout. By Captain H. M. Davson, R.H.A. 425
The Initiative in National Strategy. (A Lecture delivered at the Royal Artillery Institution, Thursday, 31st October, 1907). By Major C. Ross, D.S.O., *psc.*, Norfolk Regiment 434
Experiments in the teaching of equitation at the Riding Establishment. By Major J. F. N. Birch, R.H.A. 448
Communication in the Division. By Captain J. E. F. d'Apice, R.A., B.Sc. 457
Ratio of movement in Auto-sights. By Major L. E. B. Dykes, R.G.A. 469
Napoleon's Marshals. 3. Ney. By Capt. H. M. Davson, R.H.A. 477
The Rhine. (A Lecture delivered at the Royal Artillery Institution, Thursday, 14th November, 1907). By T. Miller Maguire, M.A., LL.D., Barrister-at-Law. 487

Digitized by Google

PAGE.

Some Remarks concerning the Royal Artillery at the Battle of Talavera, July 27-28, 1809. By Major John H. Leslie, R.A., (Retired List). 503
Swimming Horses. By Col. E. J. Phipps-Hornby, VC., R.H.A. 509
Battery Drills and Ranging Exercises with Puffs. By Captain M. H. C. Bird, R.G.A. 515
A System of Messing suitable for a Brigade of Artillery. By Captain C. C. Robertson, R.F.A. 518
A few Remarks on Major J. G. Geddes Methods of Estimating Displacement, &c. By Major A. T. Anderson, R.F.A. 524
The co-operation of the Navy and Army in War as promoted by the Naval War Course. By Colonel H. C. C. D. Simpson, C.M.G., R.A. 525
Horse Artillery and Shock Tactics. By Lieut. H. W. Wynter, R.H.A. 528
An Historical Sketch of the Battle of Maida. (A Lecture delivered at the Royal Artillery Institution, Thursday, 28th November, 1907). By Professor C. W. C. Oman, Esq., F.S.A. 541
Indirect Fire Implements and the Roorkee Slide Rule. By Major T. A. Tancred, R.G.A., and Captain O. R. Swayne, D.S.O., R.G.A. 565
A Reply to Major C. P. Martel's paper on "The method of carrying out practice in a Service Company of Royal Garrison Artillery." By Captain A. E. C. Myers, R.G.A. 571

Digitized by Google

List of Inserted Maps, Plates, &c.

(Additional to those in the letterpress)

TO FACE PAGE.

Sketch map of Somaliland. (To accompany "Somaliland and its 'Mad Mullah'." 57
Map to illustrate "The Siege Operations at Langres, August—September, 1906." 168
Frontispiece. Marshal Lannes. 169
Two plates to illustrate "A Field Scale for Indirect Fire." 185
Frontispiece. General Francis Frankland Whinyates 217
Nine plates to illustrate "The Madras Horse Artillery." 224
Sketch map to illustrate "The British Artillery at Waterloo.... 328
Frontispiece. Marshal Davout. 425
Frontispiece. Marshal Ney. 477
Map of Battlefield of Elchingen. (To accompany "Napoleon's Marshals"). 480
Map of the Rhine. (To illustrate Dr. T. Miller Maguire's Lecture on "The Rhine"). 492
Sketch map of the Battle of Talavera. (To accompany "The Royal Artillery at the Battle of Talavera"). 508

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The effect of Modern Projectiles against Battleships & Armoured Cruisers.

(Considered from recent experience).

By A. G. HADCOCK, Esq., late R.A.

THERE are always two sides to every argument, and to those not in possession of actual official reports, one side is as good as the other. Our own Naval Officers have closely watched the effect of modern gun fire during the late war between Russia and Japan, and have drawn their own conclusions, and it is therefore, certainly not out of place for the sister arm to discuss the facts also, and we may, therefore, be allowed to consider one or two of the inferences contained in the article, quoted above, by Capt. J. A. FitzGibbon, R.G.A. (see p. 386, Vol. XXXIII.).

The article is intended to deal exclusively with the effect of projectiles on armour, but starts with certain assumptions of which the origin is not stated, and their correctness is consequently open to question.

It is not from any carping motive that the present rejoinder has been written, but rather that, in the interest of the Service, deductions conformable to the actual facts should be made.

It may, perhaps, be pardonable, under the circumstances, if the various items are taken seriatim.

Russian accuracy of shooting.

No doubt the accuracy of the Russian naval gunners of the Port Arthur fleet improved as the war progressed and as they obtained practice, although opportunities for this do not seem to have often occurred; our own naval shooting accuracy has made remarkable strides in the past few years, during which a systematic scheme of battle practice has been inaugurated, under the supervision of a specially skilled naval officer. The Russian shooting at the commencement of the war appears, from Admiral Sir Cyprian Bridge's article in Brassey's Annual, 1905, to have been an almost negligible factor; on p. 119 it is stated that on the 9th February, 1904, "It was believed in the Japanase fleet that not a single shot from any Russian ship hit a Japanese ship. All the damage done by the Russians, and it was not considerable, was done by the guns of the forts," etc., etc.

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This action resulted in the damage of the Russian battleship "Poltava," and the cruisers "Diana," "Askold," and "Novik."

It may hardly be fair, on account of the disparity of the forces engaged, to instance the action on 9th February, 1904, at Chemulpho, during which no damage whatever was done to the Japanese vessels engaged, while the Russian cruiser "Variag" was badly damaged, but this action, disastrous as it was to the Russian force, produced an almost world-wide feeling of respect and compassion for the romantic heroism of the captain and crew of the "Variag."

Even in the sortie from Port Arthur on the 10th August, 1904, the Russian gunnery does not appear to much advantage. In an article, Injuries to the "Cesarevitch," Vol. 23 of the Journal of the United States Artillery, taken from the German semi-official "Marine Rundschau" of November, 1904, it is stated that "the marksmanship of the Japanese is regarded with undisguised wonder by the Russian officers. The range at which the Japanese had to score their hits is, according to Russian estimates, between 7,000 and 8,000 metres. We must not lose sight of the fact, however, that these are only estimates, for, as the Russian officers admit, the range-finders in use were not available for such distances. All the same, the marksmanship of the Japanese was excellent, and far superior to that of the enemy, inasmuch as the Japanese possessed telescopic sights, which the Russians did not. In criticising the Russian gunnery, we must not forget that the fleet bottled up in Port Arthur had very little opportunity for practice. Thus the 'Cesarevitch' used her heavy guns for the first time during the war, in the action of 10th August."

A Russian eye-witness (see Semenoff, "The Battle of Tsushima," translated by Captain A. B. Lindsay, 2nd Gurkhas) infers that although the Japanese markmanship was not of much account in the action of August 10th, it improved vastly, so that the last Russian naval effort on the 27th May, 1905, after months of preparation, met with even less success (see Brassey's Annual, 1906, p. 105).

High explosives not used by the Russians.

There appears to be no doubt that the Russians used high explosive shell (see Semenoff). The explosive they used was introduced by the famous chemist Mendeléeff, and was called pyroxoline, which was a species of gun-cotton or nitrocellulose. These shell, however, did not play the same havoc as the Japanese high explosive shell; whether this was due to defective fuzes or to the detonating medium cannot be stated with any certainty.

It is well known that the order of detonation of gun-cotton is not of so violent a nature as that of lyddite or shimosê, but many experiments which have been carried out show that it can, when properly detonated, give very formidable results.

Up to the battle of Tsushima, the opinion of experts was divided as to the actual value of high explosive shell when compared with powder-filled shell. There can be no doubt that high explosive shell give far greater local effect; but, on the other hand, the fragmentation of the shell on detonation is so great that the damage can

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be confined by comparatively thin bulkheads (see also Capt. Fitz Gibbon's remarks on " Effects of hits," p. 390). With powder filled shell the fragments are fewer, but much larger, and consequently carry destruction over a far greater depth. The result of the Japanese high explosive shell fire against the Russian ships may perhaps modify these views, but they must be taken into consideration from all points of view.

Japanese guns outclassed.

This hardly appears to be borne out on reviewing the several actions; indeed, it is difficult to conceive how one can come to this conclusion in view of the unvarying success of the Japanese arms. The tables of Russian ordnance printed in Brassey may be only approximately correct, but from these it is evident that the muzzle velocity of the 12-inch guns in the older ships sent to the East was about 2,090 f.s., while in the latest pattern of 12-inch gun the velocity is about 2,600 f.s.; it must, however, be remembered that the Russian projectile weighs only about 720 lb.

On the other hand, the whole of the Japanese 12-inch guns fired 850 lb. projectiles, and had a muzzle velocity of about 2,400 f.s.; a very simple calculation will show that the muzzle energy of the Russian latest pattern and the Japanese 12-inch guns is almost identical. Owing to the lighter projectile, the Russian gun would lose velocity much more rapidly than the Japanese gun, and consequently the latter would be the more powerful at all ranges. Even assuming, therefore, that the more powerful pattern of gun was on board the four latest-built battleships in the Russian fleet—viz., " Knyaz Suvoroff," " Imperator Alexander," " Borodino," and "Irel"—all completed in 1904, sent out with Admiral Rozhdestvensky, the Japanese guns were still more powerful at all medium and distant ranges, and equal to them when fighting muzzle to muzzle.

We have more or less dealt with the condition of the ships early in the war, later, however, when the Japanese guns had done a very great deal of firing, it will be seen from the result of the battle of 27th May, that the Japanese were still able to more than hold their own even with the latest type of a Russian battleship. Admiral Neobgatoff, at his court-martial, stated in defence (see "Times" of 26th December, 1906): "The range of our guns was 50 cables" (a cable is 200 yards). "The enemy kept at 55 cables' distance. Whenever we made an attempt to get nearer to him, he, taking advantage of his superior speed, at once retired, so that the distance was not lessened. We thus represented a target, which it was easy to fusillade, but which itself was not in a position to reply."

On p. 392, Captain FitzGibbon admits that the Russian ships of the Baltic fleet were crippled by long-range gun fire, even up to ranges of 14,000 yards. At the beginning of the war, Sir Cyprian Bridge (see Brassey's Annual, 1905, p. 119) states that during the Japanese attack on Port Arthur of 9th February, 1904, the Japanese attacked the Russian ships at 8,000 yards, and the Russian forts at 10,000 yards. As the latter were at a considerable height, it is evident that the

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Japanese guns had still a considerable horizontal range in hand; indeed, shells are said to have fallen in Port Arthur itself at spots not much less than 12,000 yards from the guns which discharged them.

As regards the design and construction of the Japanese naval guns, it is evident, from the manner in which they fulfilled every requirement even after the stress of many months' continual service against new ships, new armour, and new guns, that the English manufacturers are to be congratulated on the quality and workmanship of the material they supplied.

The Japanese propellant.

This was ordinary cordite, Mark I. It was made in England, and was in quality equal to that made for the English Service. A large quantity of this cordite was sent to Japan as long ago as 1893, and it says much in its favour that even after this length of time the cordite was able to give so good an account of itself. The Japanese home-made powder has never been used in these heavy guns on service. Certain small lots of experimental powder have been made by them, but they have followed the English Service in adopting cordite M.D.

Trouble due to this powder.

Guns, rapidly handled, firing cordite Mark I. are no doubt liable to become hotter than those using cordite M.D., and the chamber pressures will be increased above the normal. In order, however, to blow in the base of the shell, the pressure would need to be far higher than anything that could be produced by firing a hot gun. In a shell properly designed, as the Japanese shell certainly were, no premature has ever been traced to this cause. Premature explosions certainly occurred, but they were admittedly due to want of precaution in the use of the fuze. This defect was rectified after the battle of 10th August, and we hear of no premature whatever having occurred at the battle of Tsushima on the 27th May, 1905, when the same projectiles and charges were employed.

Shimosé is practically lyddite, the only difference being in the method by which it is exploded. It is well known that shell of this nature, when properly detonated, give off a dense black smoke. When, however, the shell is imperfectly detonated, smoke of a greenish-yellow colour, or even yellow according to the nature of the detonation, is produced (see FitzGibbon p. 309,). It is evident from the yellow stains noticed on the crest and on portions of the "Cesarevitch" (see p. 102, Vol. 23, Journal of the United States Artillery), that many of the Japanese high explosive shell detonated imperfectly.

As regards the damaging of five out of 16 heavy guns, Captain FitzGibbon states that these 16 guns were mounted on three battleships, but as each of these has only four heavy guns, it is possible that he forgot to include the battleship "Fuji," which was known to be present at the action on 10th August.

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Shimosé replace shrapnel.

The rôle of high explosive shell and shrapnel are entirely different, and, as a matter of fact, the shrapnel has no place in purely naval warfare. Shrapnel can be of use against the personnel only of a vessel, and for the most efficient results should, as with Field Artillery, be burst by a time fuze. If the crew are protected behind shields, or even behind the ordinary skin plating of a ship, the effect of shrapnel would be nil. An entire shrapnel shell would, no doubt, pierce the skin plating of a ship, and, bursting inside, might by luck do a lot of destruction; but no shrapnel bullet, if the burst is outside, would have sufficient penetrative power to do so.

Shrapnel shell are never carried in warships now, except for use in landing guns. Their place has been taken entirely by steel common shell and high explosive shell, although it is quite conceivable that they may in the future find employment with the secondary armament of warships for defence against torpedo craft.

It is not necessary to follow Captain FitzGibbon further, but we may, perhaps, be allowed to summarize the actual results. To obtain the full benefit of powerful gun fire, it is, no doubt, necessary to combine this with the speed of the ship. The range of the gun depends not only on the muzzle velocity and the weight of the projectile, but also on the amount of elevation which can be obtained from the gun mountings. In a closed-in turret, it is generally very difficult to obtain more than a limited amount of elevation, unless some of the protection at the top of the turret is sacrificed; but we may take it that a range of probably 18,000 to 20,000 yards will be more than sufficient in the near future, and with the high velocities now coming into fashion, these should be easy of attainment. Conning towers, as at present constructed, situated near the forward turret, are a delusion and a snare; splinters from exploding shells readily find their way through the look-out ports between the top of the conning tower armour and the roof, causing many casualties and damaging the steering gear contained therein. It may not be always possible to keep just out of range of the enemy's guns, and to keep the enemy within range of your own; but if, on the other hand, the speed of your vessel is greater than that of the enemy's, similar tactics to those pursued by the Japanese are bound to lead to very similar results.

It would appear from Brassey, 1906, p. 152, that the Japanese' favourite manœuvre was one which has very often been used in our own Navy during naval manœuvres. The Russian Admiral, Enquist, also states (p. 153, Brassey, 1906), that "Every time that our squadron turned to the North it was met by the enemy, thanks to his superior speed, and our leading ships were under the fire of the enemy's battleships," etc., etc.

Captain FitzGibbon mentions the case of the damage to the flagship "Mikasa," when a 12-inch shell perforated seven inches of armour at 18,000 yards. As a matter of fact, no penetration whatever took place; the shell ricochetted from the water, and struck the particular plate more or less obliquely with the side of the shell; the piece in

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question, unable to resist this type of shock, cracked off and fell from the ship.

The armoured portions of the ships on both sides do not seem to have suffered any material damage, either by armour piercing shot or from high explosive shell; indeed, it would not be expected that the latter type would be effective against even thin armour, except when a direct hit was obtained. The probability of obtaining direct hits at short range is exceedingly remote; it is still more improbable at long ranges, where the curvature of the trajectory adds to any obliqueness. It was the unarmoured parts of the Russian ships which suffered so grievously from the effect of the Japanese high explosive shells; they also appear to have had so much wood-work about their vessels, that the smoke from the numerous fires produced by the bursting shell, igniting the wood, seriously incommoded the crew, and caused great anxiety on account of the possibility of explosion of gun charges (see Semenoff).

Finally, the Japanese naval officers wisely never risked an engagement after 9th February with the Port Arthur forts, although they bombarded the harbour on several occasions subsequently at very long range, in the hope of preventing or delaying repairs to the damaged Russian vessels. They appear to have had a wholesome dread of jeopardising any of their vessels by an action with these forts. They always risked an engagement, however, whenever they met any of the enemy's ships, in the hope of sinking one or more of their vessels; but they fully realized that fighting a fort might result in the irreparable loss or damage of some of their own ships, without the infliction of any corresponding loss to the Russian fleet which would equalize the forces.

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Concealed Positions for Field Artillery.

By COLONEL F. D. V. WING, C.B., R.F.A.

AN excellent article by Major Cadell, on the position for quick-firing shielded guns, appeared in the December number of the Journal of the Royal United Service Institution.

This subject is of interest to all officers, but especially to those of Artillery, as well as to those likely to hold high command, and is worthy of wide discussion, which it would be interesting to evoke in this Journal.

With this object I offer the following remarks on the subject, which I had written previously to reading the above-quoted article, and which express briefly the same opinions:—

"Whether the concealment of batteries in action, and consequent loss of fire power, is not now receiving too much encouragement, and may consequently have some undesirable results. . .

"Now, when other things are equal, there can be no doubt that it is advisable to fire from concealed positions, but there are so many considerations which modify the question that it is well to think over certain disadvantages entailed by having guns thus placed. When there is plenty of time, and the targets are decisive, a concealed position seems desirable, and such conditions doubtless may frequently occur.

"But even then it can seldom be certain that a rapid change to a new target may not be necessary, and though it is easy at manœuvres, when using blank ammunition, to order a switch, and claim that fire is turned on to a new, unseen target, the results of watching various batteries carry out similar schemes when practising with shell prove that effective fire at the new target is frequently delayed for such a time as to nullify its effect from a tactical point of view.

"When actually fighting the enemy's guns seems the most reasonable time for hiding one's own; but even in such a case it may occur that speed in silencing them becomes all-important, and it may be better to hazard heavy losses by pushing guns into the open, and increasing their accuracy by direct laying.

"An important essential for a concealed position seems, therefore, to be that the guns are so placed that they may be pushed rapidly into direct fire if required. Again, the support of the Infantry attack will in future, we hope, be carried out with a perfect system of communication between guns and infantry, the latter of which will rely on the immediate support and accurate fire from the guns on any

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point of the enemy's position that the circumstances of the moment may require. Such prompt support can only be given by direct visual laying.

"In all operations with Cavalry who are in near touch with the enemy, it seems doubtful if guns will ever be justified in taking up concealed positions, as they must be ever ready to give immediate support and open a rapid fire on an unexpected enemy. It would be a dreadful position for an Artillery Commander to find his guns in such a position as to be unable to give his Cavalry that prompt aid which they have a right to expect and rely on in cases of emergency. We are not the only nation which bases its military training on the latest war, and we must remember that the late war between Japan and Russia, gigantic though it was, gave very limited results in Cavalry operations, and no justification for concealment of guns at such.

"Though it is our duty to impress on our soldiers the advantages of entrenchments and cover, whenever and wherever they can be used, without reducing the efficiency of their fire, be it gun or rifle, it is only human nature to suppose that a too common instruction to hide carried out at peace manœuvres, may become too much magnified in time of war, when there is a further inducement to take cover, owing to real instead of imaginary shell and bullets. The excellent shields provided for our new guns are a further reason to take risks in the open, that without them it might be impossible to take even to gain a substantial increase in fire effect."

The above remarks occurred to me from observation of manœuvres, and follow the same line of thought, though they cannot compare with Major Cadell's conclusive and well-thought-out arguments. With reference to the subject, I draw attention to an interesting letter written by Captain Charrier in this month's number of the Royal United Service Institution Journal, which expresses very clearly the practical Infantry view of the question. As the opinions I have referred to are generally unanimous, it would be interesting if we could find an advocate to dispute them, as it is well to hear both sides of a case. The highly instructive remarks by General Sir Ian Hamilton at last year's training in the Southern Command comprise some very valuable comments on this subject; he "is convinced that the employment of indirect fire constitutes the most difficult part of Artillery training, and that once the detachments have thoroughly mastered this method, they can always be relied upon to fire direct when required."

This is doubtless the sound technical view of the case, but there is a more general point which must not be overlooked, which is that if the teaching at manœuvres is in favour of concealed position for field guns being the rule rather than the exception, there is a danger that our future Generals, who are now acquiring their tactical ideas, may be likely in future wars to check that bold handling of guns, which at critical times must have a decisive result in a fight. The batteries will doubtless be ready to push into the open, as Sir Ian Hamilton remarks, and if he is in command, every Artillery officer will have complete confidence that they are not unduly checked, and that

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any position he selected would be the best, but "autres hommes, autres mœurs," and it is the over-caution of the average General which must be guarded against, which has already in past wars prevented guns pushing forward at a critical moment.

A further quotation as regards Infantry training, from the previously quoted remarks on training in the Southern Command, applies equally well to these considerations—"It is easy to teach troops to be over-cautious, but it is bad to command them when that lesson has been learnt."

It appears, then, that the taking up of concealed positions should be insisted on to a high state of proficiency as a battery and brigade drill, but its practise at tactical exercises should not be carried so far as to inculcate any idea that, except in very special cases, loss of fire effect should be risked in order to gain immunity from loss of personnel, or to contradict the three objects of artillery, "first to hit, second to hit, third to hit."

With reference to the foregoing, I call attention to the following extract from the introduction written by General Sir John French to the translation of General Bernhardi's book, "Cavalry in Future Wars," which, though referring to Cavalry, may, from the point of view of training, be regarded as equally applicable to Artillery:—

"After the war of 1866, the great Von Moltke made the following report to the King of Prussia: 'Our Cavalry failed, perhaps not so much in actual capacity as in self-confidence. All its initiative had been destroyed at manœuvres, where criticism and the blame had become almost synonymous, and it therefore shirked independent bold action, and kept far in the rear, and as much as possible out of sight. . . . . To sum up, training with a view to self-sacrifice during peace exercises is essential for the success of all arms in war, but especially so for Cavalry.'"

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A Method of ranging with Time Shrapnel, chiefly for use against Balloons and Search-lights.

By CAPTAIN C. C. NOOTT, R.G.A.

THE method of ranging about to be described requires the use of graticuled telescopes or field glasses, and can be used against any stationary or slow-moving target; but it is chiefly of advantage against captive balloons and searchlights.

Three graticuled telescopes or field glasses are required, and they will be referred to as:—

(a) Two with the graticules vertical.

(b) One with the graticules horizontal.

Glasses (a) are used a few hundred yards apart, one being preferably near the battery and the other to a flank. Their use is to give the distance over or short of the target that a shell bursts in the air, as described in "Garrison Artillery Training," Vol. II., (Siege), section 49;—which is merely section 47 of "Field Artillery Training" carried a little further.

Glass (b) is used near the battery to give the height of burst in minutes above the line of sight.

All these glasses being fixed up with their centre graticules on the target, and kept so, the range is estimated or taken as accurately as possible and a round of time shrapnel is fired with the fuze set for the range or a little short of it.

Glasses (a) will give the distance of the burst over or short of the target. Glass (b) will give the minutes above or below the line of sight; and this being known it can be easily converted into yards by proportion, from the amount that 5 minutes alters the point of impact vertically at the range.

Also, when the height of burst is known, the distance of the burst short of where the trajectory would cut the line of sight can be found by proportion from the angle of descent at the range.

These two operations can readily be done simultaneously by means of a factor obtained as follows:—

$$\frac{\text{Yds. vertically due to } 5' \times \text{denominator of slope of descent}}{5 \times \text{numerator of slope of descent.}}$$

Multiplying the height of burst in minutes by this fraction, which should be reduced to its simplest form, will give the distance in yards that the burst was short of where the trajectory would cut the line of sight.

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It then becomes merely a matter of addition or subtraction to determine the distance short or over the target that the trajectory would cut the line of sight; that is, the error of the range given to the gun.

Expressed graphically, as in the figures, all this means that glasses (a) give the distance S^1T and glass (b) gives the distance S^1R; required to find the distance RT.

T is the target, S is the burst of the shell, S^1 the point where its ordinate cuts on the line of sight, and R is the point where the trajectory would cut the line of sight.

The following examples (with the 15 pr. gun) will show the procedure:—

Range, 3,000 yards.

Apex angle, 10 degrees = 600 minutes.

Slope of descent, $\frac{1}{6{\cdot}4}$

5 minutes gives 4·36 yards vertically.

The factor for glasses (a) is $\frac{3000}{600} = \frac{5}{1}$

That for glass (b) is $\frac{4{\cdot}36 \times 6{\cdot}4}{5 \times 1} = \frac{28}{5}$ approximately.

A shell bursts in the air, and is observed by glasses (a) as 20 minutes left from the right and 10 minutes left from the left; that is, 10 minutes short, which equals 50 yards short. That is, S^1T in fig. 1 is 50 yards.

Glass (b) observes the shell as 15 minutes up, and this multiplied by $^{28}/_{5}$ gives 84 yards, so that the trajectory would cut the line of sight 84 yards further on, or S^1R equals 84 yards. The target itself is 50 yards beyond the burst, so that the trajectory would cut the line of sight 84 − 50 = 34 yards beyond the target. That is, TR is 34 yards and the range is 34 yards too much.

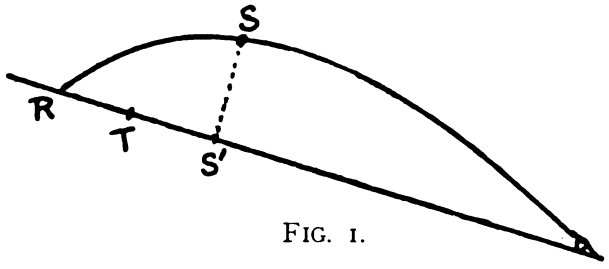

FIG. 1.

Ex. 2. (fig. 2). Glasses (a) observe a shell as 10 minutes right from the right, and 20 minutes left from the left; that is, + 30 minutes = + 150 yards = S^1T.

Glass (b) observes it as 10 minutes up, so that S^1R = 56 yards. Therefore TR = 206 yards. (The fuze is too long, also).

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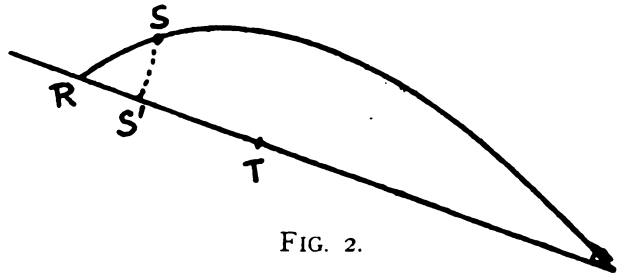

FIG. 2.

Ex. 3. (fig. 3). Glasses (a) observe a shell as 25 minutes right from the right, and 10 minutes right from the left; that is, +15 minutes = +75 yards = S^1T.

Glass (b) observes it as 20 minutes *down*, so that the trajectory *has* cut the line of sight 112 yards back from the burst ($S^1R = 112$ yards). TR therefore = 112 − 75 = 37 yards, and the range is 37 yards too short. (The fuze is too long).

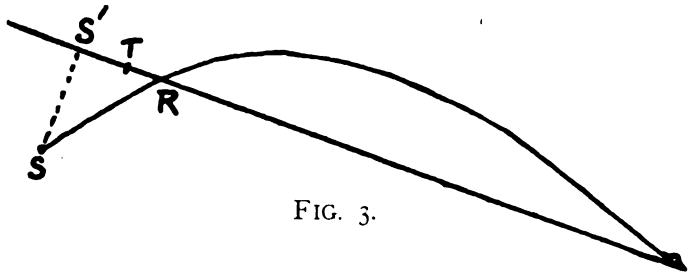

FIG. 3.

Ex. 4. (fig. 4). Glasses (a) observe a shell as 10 minutes left from the right, and 5 minutes right from the left; that is, −15 minutes = −75 yards = S^1T.

Glass (b) observes it as 25 minutes down, so that $S^1R = 140$ yards. Therefore TR = 215 yards, which is the amount the range is too short.

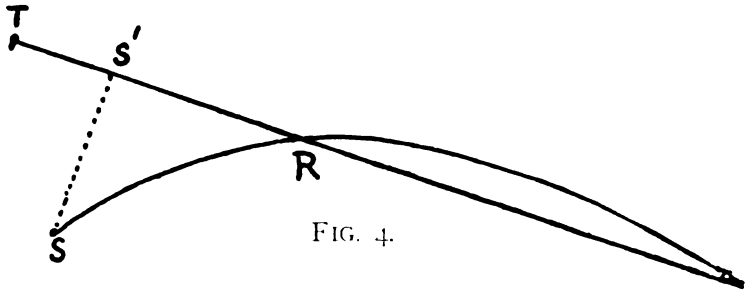

FIG. 4.

The calculations are so simple that they only take a few seconds, once the two "factors" are found; and these only take a few minutes

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to work out. The first one is merely the fraction $\frac{\text{Range}}{\text{Apex angle}}$; the range is taken by mekometer, and the apex angle is given by the field plotter, for it is merely the angle (expressed in minutes) at T in the well known triangle "TOB," and this is given by subtracting the sum of the angles at O and B from 180°. The second is got almost direct from the range table. In both cases the use of a slide rule is a help, and by it the results of each round can be read off direct;—but it is not essential.

The system does not claim to save time, though in some cases it probably would do so to a very considerable extent, but in nearly every case for which it is suitable it should very greatly save ammunition. The principle is not, of course, mathematically accurate; but it is a near enough approximation to be practically so, provided the range has not been wrongly estimated to the extent of several hundred yards; and in that case it only requires a correction of the factors after the first round. Three rounds should give the range in any case.

In firing at balloons this system is suggested for the following reasons:—

Time shrapnel is the only feasible projectile to range with; and, considering that a balloon is only about 30 feet in diameter, the system of ranging with time shrapnel described in "Field Artillery Training," section 43, is likely to require a large quantity of ammunition and to take a long time. In the system here described it is immaterial, for purposes of ranging, whether the shell bursts in line with the target or not.

Searching and sweeping about the balloon requires a good deal of ammunition, which field guns might spare but hardly heavy guns.

Since a balloon will naturally get as far off as possible, provided it can effect its purpose, it may be necessary to employ heavy guns and economy of ammunition is especially important for them.

In ranging at balloons by the method here suggested, since the balloon to do any good must be high enough to see into the folds of the ground it follows that the balloon can be seen from these positions, and therefore the laying will be direct and there will be ample choice of positions for the observers. Of these, the one previously referred to as (b) and one of those referred to as (a) should be close to the guns; the best distance for the other will vary according to the glasses used. With fairly high power telescopes the field is not large, and therefore this distance should not be more than a few hundred yards, while with prismatic field glasses with a large field it may be a thousand yards or more; which is an advantage, as the factor $\frac{\text{Range}}{\text{Apex angle}}$ becomes small, and errors in observation are not magnified so much as when it is large.

The observers being in position the ranging can be carried out as already described, preferably with one gun. Having obtained the range (which under favourable circumstances should not take more than two or three rounds) a rapid fire can be opened from the whole

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battery, and if the balloon is fairly steady, it should very quickly be brought down.

It will, however, probably not be very steady, and the three motions it may have, might be dealt with as follows:—

(i) Vertical motion. Since the laying is direct this only matters so far as it takes place during the time of flight. If this is not much it will probably be met by the spread of the bullets, variation of the fuzes, and the 50% zone of the gun. If it is considerable, slight variations in elevation can be given to each section.

(ii) Lateral motion. This will be met by distributing the fire of the battery to the extent of about 10′ deflection for each gun.

(iii) Alteration of range. This is the most difficult problem of the three, because it is not apparent. It is as well to have the range continuously taken by the mekometer and if the variation is considerable, and always in the same direction, to alter the elevation accordingly as this would seem to show that the balloon was being moved. If the variations are small or not always in the same direction they may be caused by the wind and will probably be met as in (i).

Since most damage is done to a balloon and it is brought down quicker by hits on the top, that part of it should be taken as the target and not the car.

In firing at searchlights it is very difficult to observe any shell bursting beyond the beam from the observer's position, and also extremely difficult to observe percussion shrapnel at all. Therefore, the ordinary systems of ranging are not very suitable for this class of target.

By placing all the observers on the same side of the beam, and ranging to that side with time shrapnel, the system here described can be easily carried out; and the range once found the fire of the battery can be switched on to the light itself; and time, as well as ammunition, is probably saved.

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LINES OF FIRE.

By CAPTAIN H. G. LLOYD, R.F.A.

PERHAPS one of the most ordinary situations for a Field Battery in astion to be in is under cover, with the "Observing Officer" within 500 yards of it. There are numerous ways laid down and suggested by which, under these conditions, parallel lines of fire on to the target may be obtained; but it may not be amiss to put forward what appear to be the most practical for use in the field. That is to say, to endeavour to point out what seem to be the methods to adopt and what to avoid on account of complications of displacement, which are simple in theory, but confusing to many in practice.

The object is to adopt a method which makes the problem as simple as possible.

With regard to parallelism, it is unnecessary to say more than that an aiming point at right angles gives parallel lines, and also one very far distant—far distant, that is, compared to the range of the target.

With all other aiming points, when parallelism is desired, corrections have to be made for each gun. Such should therefore only be used with caution.

The following remarks are confined entirely to cases where a distant observing station and the plotter are not used.

(a). i. The simplest situation of all—*i.e.*, one avoiding all complications—is when the director is set up in the battery in prolongation of the Battery Commander's aiming posts. In this case, take a flank aiming point if possible, otherwise, one very far to the rear or front.

Our English practice camp grounds, and the fact that at practice camp the movements of the guns and the selection of the gun positions, are, as a rule, absolutely unhampered by the presence of other troops, are apt to give the impression that the target will usually be visible from a point near the battery in the line of fire. An examination of almost any English country, however, which is not moor, plain, or down-land, shows that, as a rule, the crests of hills or undulations are wooded, and that it is impossible to plant the two aiming posts in the line of fire and align them on the target.

ii. When "the battery director is in line with the Battery Commander's aiming posts, and in prolongation of the battery."

Take an aiming point as near as possible *in prolongation of the line of guns*, or use the director itself as the aiming point. Displace-

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ment for the distance that the director is to the flank of the battery must be given (subtracted if the aiming point is on the same flank of the battery, and added if on the other flank).

Thus. B is the battery, D the director, A_1 A_2 flank aiming points, T the target, and θ the displacement angle.

In this case, all the guns must be exactly in dressing, aligned on the director.

The occasions will undoubtedly be rare when the ground will admit of the guns being placed exactly in alignment, or might only admit of their being got there with great difficulty.

It is inadvisable to take any other aiming point than one in prolongation of the guns.

(b). When the Battery Commander's director is under cover, in line with his two aiming posts *at the observing station.*

Do not use the aiming point method at all, unless the director is very close to the battery. That is, do not select an aiming point from the observing station, and attempt to calculate the battery angle ABT from the measured angle ADT.

The displacement problem though simple in theory, is apt to be confusing in practice, and it is far better to avoid it altogether by adopting another method (*c*) or (*d*).

(c). Is the method of giving an angle to each gun; but if the director is at the observing station, the displacement angle for the perpendicular distance that that point is from the line of fire must be added or subtracted from *each* angle given.

This is undoubtedly a source of error. It appears, therefore, that the best plan to adopt in this case is *(d).*

(d). "A combination of methods (*a*) and (*c*)."

An angle being given (remembering the displacement) to the other director set up in the position of the battery, or to one gun. If to the other director, the battery leader finds the line, and then proceeds as in (*a*) (i.); if to one gun "the Section Commander directs it on the line," and uses the goniometric sight as a director to measure the angle to the selected aiming point. Or each gun can get its line parallel to the one next it by the following means:—

Suppose No. 6 gun has got its line, and has its goniometric sight-bar at zero in this line. No. 6 gun then measures the angle subtended by the target and the goniometric sight of No. 5. No. 5 puts on the same angle on his sight, and traverses the trail until his sight is *laid back* on No. 6. This process is carried on from 5 to 4, and so on. A lengthy and clumsy business.

Or, again, if the guns are all exactly in dressing with the one that has its line, the same angle from that gun brings, of course, all the lines parallel.

A word about the displacement angle. The size of the angle is roughly estimated without difficulty either by working out the small proportion sum, by an easily remembered table, by referring to a card with a more detailed table on it, by a special slide rule, etc. But it is sometimes confusing, even when not using an aiming point at all, to remember whether to add or subtract it from the angle measured.

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If, however, when measuring the angle TDB, after pointing the director towards the target it be then laid on B (the gun sight or the other director), the opposite way—*i.e.*, by using the former foresight as the back-sight, the angle supplementary to TDB is read. The displacement angle is then *always* subtracted. The resultant angle is the one which is actually put on the goniometric sight (or other director) to the same side as it is read off the director, and the gun layer never has to use his sight the reverse way.

If the director and goniometric sights were used as in Capt. Noott's most excellent suggestion in the December, 1906, number of the "Journal," the displacement angle would have to be added to the angle read if the director were on the left of the battery, and subtracted if it were on the right.

It would appear, then, from a close consideration of the numerous ways by which parallel lines of fire on to the target may be obtained, that many are open to such pitfalls, that it might be sound to eliminate them from practical use in the field.

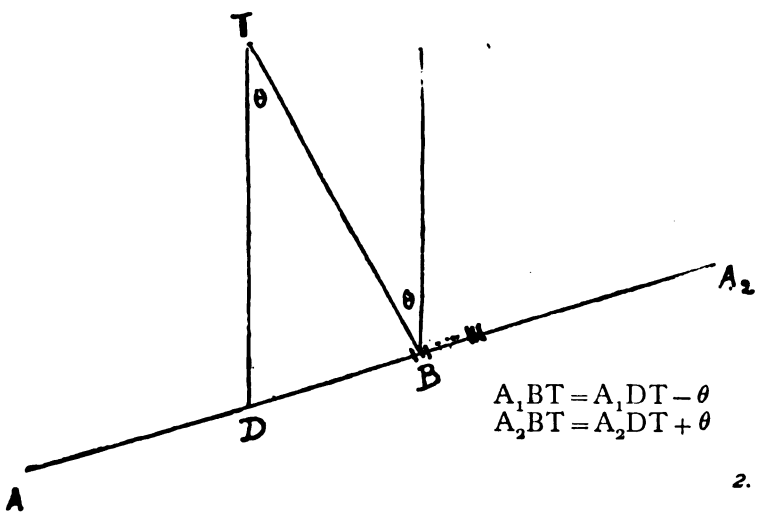
The best idea to keep in one's head is to reduce the problem to case *(a)* (i.), or, in other words, to get two aiming posts into the line of fire.

If the target is visible from in front or in rear of the battery this is done at once. If not, give the necessary angle TBD, where B is either the goniometric sight of one gun, or the other director set up in the battery.

Once these aiming posts are fixed and a sight or director in line with them, an aiming point can be taken anywhere, having due regard to parallelism, without any complications of displacement or anything else.

The following procedure has been found both simple and practical. It can be carried out in every case when the battery is in a concealed position, and the Battery Commander is the observing officer.

It is immaterial whether the Battery Commander obtains the bat-



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tery angle by means of the plotter or otherwise—that is, whether the observing station is a distant one or not.

(For clearness, I have numbered the two directors 1 and 2.)

The Battery Commander's trumpeter carries his two aiming posts, No. 1 director, and the telescope.

The Battery Serjeant-Major carries No. 2 director.[1]

The Battery Commander reconnoitres and fixes on the positions of the battery and of the observing station. If the target is visible from the line of fire near the gun position, he plants his two aiming posts in that line.

The Serjeant-Major plants No. 2 director in line with them.

If the target is not visible from the line of fire, the Serjeant-Major sets up No. 2 in the selected position of the battery, and the Battery Commander tells him the general direction of the target. The latter then rides off to the observing station, there sets up his two posts with No. 1 director under cover in line with them, and at once proceeds to find the battery angle (B being No. 2 director). In either case, the Serjeant-Major, having planted No. 2 director, rides back to the battery, and guides it to the position.

On the battery approaching the position, the battery leader gallops forward to No. 2 director, unless he is told by the Serjeant-Major that the Battery Commander is remaining in the position; this he would do if observation is to be effected from ladder, limber, tree, etc., in or near the battery.

The battery halts, in line if possible, close up, but not quite on to the position.

If the battery leader finds the line of fire laid out, he at once selects the aiming point and measures the angle.

If he does not find it so he receives the battery angle from the Battery Commander by signal or telephone, and thus finds the line.

Having measured the angle ABT, he kneels down, and the battery drives up, centre on the director. If it should happen that absolutely no suitable aiming point is visible from the position of No. 2 director, the Battery Commander if there, otherwise the battery leader, halts the battery somewhat short of the director, brings it into action, and gives an angle to each gun.

If horses are available, it is of great advantage that four signallers should accompany the Battery Commander when he goes forward.

When the reconnaissance is finished, if both directors are to be used, two signallers stay at No. 2 director, and two go to No. 1.

If, now, the observing station is not a "far distant" one, the Battery Commander will probably have found and signalled down the battery angle before the battery leader arrives. The horse holder of this second pair of signallers, can also hold the battery leader's horse when he comes forward.

In any case, signalling communication is established before the battery comes into action, and before the telephone wire could be laid out. There is thus a considerable saving of time.

[1] Since writing the above it has been found by experience to be more convenient for No. 1 Director to be carried by the horseholder of the pair of signallers who go to the observing station, and No. 2 Director by the horseholder of the pair of signallers who remain at the position.—*H.G.L.*

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Slide-Rule Methods Examined.

By CAPTAIN J. D. B. FULTON, R.F.A.

RECENT contributions to the literature of the fascinating subject of indirect laying instruments must have convinced readers of the "Journal" that it is a theme which is arousing a very widespread interest. It is certainly one which well repays very careful study, and a tendency can easily be traced throughout all the most recent developments of fire-tactics to accord to "indirect" methods, an importance which it would be hard to exaggerate.

Colonel Prinsep's description, in the December issue of the "Journal," of a "Deflection and Slide-rule" is most interesting, and specially so on account of the claim put forward that it instantly determines several important data without mental calculations of any description, and without recourse to pencil and paper.

Now, that claim is made the basis for bringing forward certain slide-rule computations as a substitute for other and more familiar means of determining the same data. It is, perhaps, therefore permissible to examine the results obtainable by the instrument somewhat closely.

Taking the sub-heads in the same order as in Colonel Prinsep's paper, we come first to:—

(a) Determination of the angle-of-sight for a battery, from an observing station.

If this method be analised, it will, I think, be found that it amounts to the working out, by means of a slide-rule, of the familiar formula:

$$\frac{a' \times BO + a'' \times OT}{BT}$$

Now, in working out this formula with pencil and paper for determining the angle of sight, which is the method laid down in "Field Artillery Training," the variations in the relative heights of the observer, the battery and the target are automatically provided for by the variation of the signs preceeding the angles a' and a'', according as those angles are determined as being elevation or depression.

A moment's reflection will make it clear that there are four different solutions to the formula, each satisfied by a variation in the relative heights of O. B. and T.

But provided that the proper signs are prefixed to the angles a' and a'' in the statement of the formula, the four different cases may be lost sight of, and the working out of the formula becomes a defi-

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nite arithmetical exercise, in which accuracy is, of course, essential, but calling for no reflection as to which particular one of the four cases is being worked out.

Colonel Princep's method, however, depends on the addition or subtraction of two variable quantities—the vertical distances of observer and target respectively, above or below a horizontal plane passing through the battery.

Now, according to the lie of the ground, these two quantities may be either both plus, both minus, the greater plus and the less minus, or the greater minus and the less plus.

They are therefore capable of making four different *algebraic* sums; and in order to use the slide-rule method, an appreciable amount of reflection is required in order to determine whether they have to be added or subtracted—if subtracted, which must be taken from which, and what sign must be prefixed to the result.

To put it in a slightly different form, (I reproduce Col. Princep's figures throughout when necessary):—

The solution depends on determining the *algebraic* sum of these two quantities; see Fig. 1:—

AC sin angle CAD
and AB sin angle ABF

either of which may be plus or minus.

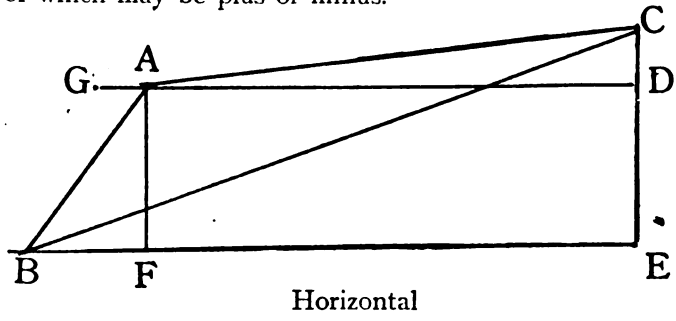

FIG. 1.

These two quantities are, of course, perfectly easily determined by the slide-rule, *but* (and this is the point on which I wish to lay stress (*only one quantity at a time can be determined*, and it must be carried in the head together with its proper sign, whilst the *other* quantity is being determined, also with *its* proper sign; the two quantities, with their signs, must now be remembered, their algebraic sum made *mentally*, and its sign noted, after which alone can the *third* distinct operation of setting the slide to read off the angle required be carried out.

It has not escaped me that the slide-rule method has the advantage over the "formula" method of absolute accuracy, since the "formula" takes no account of the sines of angles, being based on the assumption that the sine of an angle is proportional to the angle itself. But the results obtainable by the formula are so nearly accu-

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rate for the small angles with which it deals, that the error may be neglected in practice.

I think practical gunners will bear me out in saying that absolute accuracy of the angle of sight is not essential to within a very few minutes.

I have ventured to analise so closely the use of the slide-rule method, in view of Colonel Prinsep's statement in his opening paragraphs (page 373) that the required angle can be determined without mental calculations of any description. In this connection, I find in Captain Nootts' able paper in the same "Journal" this sentence, which appears to be specially noteworthy: "Any calculation, however simple, involves a chance of error."

If we are obliged to choose between two evils, that of calculating mentally or calculating on paper, let us not neglect to weigh carefully the considerations on each side before we decide off-hand against the paper method, having regard to the conditions under which the calculations are to be made, "at a time," as Major Cooke says,[1] "when one's arithmetical faculties are generally chaotic."

But both slide-rule methods and paper solutions of formulæ leave something to be desired. It has always seemed to me that a very substantial advantage is gained whenever what may be termed a "mechanical" process, such as the pulling of a lever, the adjusting of a pointer on a scale, the tightening or slackening of a nut, or the laying of sights on a given object, can be completely substituted for a *mental* process, which, however simple it may appear when examined at ease in the lecture-theatre or on the barrack-square, nevertheless takes on an entirely different complexion under the difficult and disturbing conditions under which an observing officer finds himself on the occasions which should be the consummation of all his studies in peace-time. *Manual* rather than *mental* dexterity has always been recognized as the more reliable in a crisis. We train a gunner to "go through the motions" of, say, withdrawing the safety pins of a shell, thus placing more reliance on the "mechanical" habit he forms than on a mental habit which we might inculcate of remembering that the operation is necessary.

With this object in view, some time ago I designed an instrument for the purpose of calculating angles of sight from the observing-point. It was, in point of fact, a kind of calculating machine, but with this advantage over the slide-rule—nothing had to be carried in the head. The four data, Range to Target, length of Base, Angle of Sight to Target, and Angle of Sight to Battery, were all "set" on clearly-marked, separate scales by definite movements of indicators; each "setting" remained visible, and could be checked, *after* the final answer had been read off its scale; and no signs had to be carried in the head, since the scales on which the angles were set were graduated for both elevation and depression, as was the "answer" scale on which the required angle was read off. The instrument, in short, *mechanically* solved the formula on page 122 of "Field Artillery Training."

[1] "December, p. 380."

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It was naturally somewhat complicated internally, though the exterior was simple enough; and Mr. Steward, the instrument maker, was able to make it so accurately that no error could be detected in many experiments made with it at Glen Imaal Camp.

However, this instrument had been designed on the assumption that, in order to determine the battery angle of sight to the target, the range from observer to target must be known, as well as the length of the base and the angles of sight from observer to target and observer to battery. When, however, later experiments showed me that *none of these data are necessary*, the "calculating machine" was abandoned as clumsy and out-of-date, and I designed an improved instrument, which, in addition to discharging all the usual functions of a director, enables the angle of sight from battery to target to be immediately and directly determined from the observing point, without employing any formulæ, and without any effort of memory, or *any* mental or paper calculations whatever.

A model of this instrument is now under consideration by the Director of Artillery, and I hope to be permitted to give a description of it in these pages at an early date.

Taking seriatim the other uses to which Colonel Prinsep's scale can be applied, we next reach

Subhead (b) Displacement.

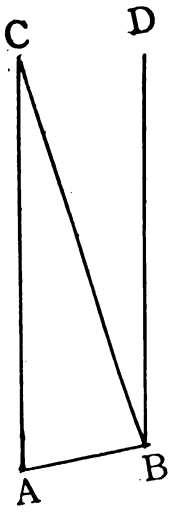

FIG. 2.

In this figure (Fig. 2) B is the battery, A the observing point, and range AC.

Col. Prinsep says: "Measure or estimate the distance AB perpendicular to BC."

Now, unless the points A B and C lie so that A B C is a right angle, which will seldom be the case, the perpendicular from A will meet the line C B either between C and B, or at some point on C B produced.

In the first case, in order to measure or estimate the length of the perpendicular, an observer must be able to determine a point lying on the line C B. To do this, apparently the only method would be to go to the point personally, and to ascertain *when* one is on the line C B, either by the use of a stick laid on the ground, or by using the director. Now, there would presumably be rising ground at this point, and the moving about which would be entailed, perhaps with a director, would probably be in full view of the enemy, and at any rate undesirable from other obvious considerations. It is doubtful if any estimate could be made without ascertaining a point lying on the line CB; if it could, it would be an extremely rough one.

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Subhead (c) "Switches."

As regards this application of the Scale, I have only to again urge the desirability of preferring "mechanical" to "mental" methods. We have an excellent and well-tried "mechanical" method in the plotter, which has also the advantage of not involving the "estimate" involved in the "Scale" method. Towards the end of subhead (c), the difference between mental and mechanical methods is very strongly emphasized by the formidable "rule for switching when the base angles have not been taken." But this rule nevertheless involves the use of the angle of switch, thus pre-supposing the availability of the director, unless it is intended to have recourse to the "arm's-length" scale, a makeshift at best for measuring such an important angle. And if the director is available, then it is difficult to see under what circumstances a practical gunner would find it advisable to neglect the simple and direct means for switching which it provides in conjunction with the plotter, in favour of a complicated rule which (it cannot be questioned in this case, I think) invites error.

Subhead (d).

A deflection ruler for determining angular measures is not accurate unless made for a radius represented by the length of the arm of the officer who is to use it, unless the distance of the scale from the eye is made to depend on the length of a string held between the teeth or looped round the neck. To provide every officer with a scale graduated to suit a standard radius of 27 inches would be worse than useless. Either a string would have to be attached to the scale, or the graduation of it would have to be made to suit individuals. I imagine the latter course would entail a modification of one of Colonel Prinsep's later statements, that the scale could be produced in quantities at a moderate cost. Chapter IV., "Field Artillery Training," directs all officers to provide *themselves* with a deflection rule, and it is possibly *because* it has been found impossible to standardize this undoubtedly useful article that a Government pattern has not been issued. But by this time all officers have ascertained, as advised in "Field Artillery Training," what angles are subtended by various parts of the hand at arms' length, and the measurements they could make by that method would be at least as accurate as those made with a standard scale unsuited to their length of arm.

Subhead (e).

It does not seem probable that it would frequently be necessary to determine in a measure of *length* the extent of a target. If the information were required as a guide to the strength of opposing troops (as hinted at in Colonel Prinsep's paragraph), it would have no practical value; for in the case of Infantry, modern formations furnish little indication of the numbers present in relation to their front; while in the case of Artillery, for the "scale" method to be applicable at all, the flank guns must be visible, and, if so, one might reasonably

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expect the intervening guns to be visible also. The simplest way, therefore, to ascertain their numbers would be to count them.

If the information is required for the purpose of allotting extent of target, it is likewise valueless. A target can be more accurately and more easily allotted in degrees than in measures of length. What Battery Commander or Section Commander would hesitate in a choice between getting the order to engage that portion of the target "extending two degrees from the white rock," rather than "extending 120 yards from the white rock"? In the first case, the extent of target can be instantly ascertained with the director; in the second case, resort must be had to a calculation, either with or without a slide-rule, or a table must be consulted.

But it is conceivable that some other case might arise in which it is desirable to know in a measure of length the extent of a target.

For instance, an Artillery Commander might wish to *know* the front of a target in yards, in order to be able to allot it to his batteries, even though he would make the allotment in degrees.

I therefore requested the junior officer of my battery to be good enough to inform me how he would propose to do this, adding that I had seen the description of an instrument for the purpose which involved nothing more than making one estimate and doing one sum in the head.

He seemed a little offended, and referred me to what he described as the usual rule, "Field Artillery Training," Chap. IV., Sec. 24. There I found the following:—

"Practically, each minute of deflection on the sight gives a difference of one inch in every 100 yards of range." This can be conveniently expressed thus:—"One degree makes 5 feet difference on the target for every 100 yards of range."

Now, I admit that this is a *Rule;* but it is one which is, and always has been, at the finger-ends of every practical gunner; and in default of a "mechanical" means of determining what is required, we are not entitled to fly immediately to slide-rule methods without ascertaining whether those methods have in this instance any advantage over the rule of thumb.

Both methods involve estimating or taking the range, and *both* methods require the multiplication in the head of the number of hundreds of yards in the range by another number. So where is the slide-rule's advantage? Only in a greater theoretical accuracy of no practical value in the field.

I hope I have said enough to induce officers of the regiment to consider the desirability of viewing with suspicion proposals for carrying out by mental processes, however trivial, any operation in the field which can be more readily and more safely performed by what, for want of a better description, I have termed "mechanical" processes.

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Barr & Stroud Rangefinder, F.Q. Type, "Infantry," 31½ inches (80 cm.) Base, for use with Infantry, Cavalry and Machine Guns.

The approximate uncertainty of observation with this rangefinder, at a range of

600	yards is	2	yards.
1,000	,,	6	,,
2,000	,,	24	,,

BARR & STROUD,
Anniesland,
Glasgow.

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SIEGE ARTILLERY LESSONS FROM PORT ARTHUR.

(Written at the request of the Committee)

BY COLONEL E. G. NICOLLS, R.G.A.

The Investment:—

ON the night of the 30th-31st July, 1904, the 3rd Japanese Army, under General Baron Nogi, surprised at dawn the heights immediately in front of Port Arthur, occupied by the Russians, drove the centre of their Army in confusion within the main defensive line of the fortress, and completed the investment of the place.

The operations that had taken place in the Kwantung peninsula previous to this date, though very interesting in themselves, belong properly to the study of fortress warfare, and will not, therefore, be considered in this paper.

The siege operations which it is proposed to study, begin with a close investment of the fortress, and comprise its close attack.

The plan it is proposed to follow in looking for the lessons to be learnt from this interesting siege, is to give a brief narrative of its principal events, and to comment on the operations as they pass by.

It is thought that by adopting this plan a clearer view will be obtained, and an easy way will be left open to each one to form his own opinion on the conclusions drawn.

General Situation:—

On 31st July, 1904, the general situation was as follows:—The 3rd Japanese Army, consisting of three divisions and two Reserve brigades, were holding the line of investment in front of Port Arthur. In addition to the Divisional Artillery, there was an Artillery brigade of 72 field guns, and a total of 188 other pieces of ordnance, mostly mortars, but comprising heavy field guns and heavy howitzers, the heaviest piece being a 15 c.m. howitzer. Few of these pieces were capable of producing much effect on permanent works. The total strength of the Japanese Army was about 64,000.

The Russian garrison occupying Port Arthur was probably somewhat over 40,000 men. The land defences had been put into a very fair state of defence. The section East of the valley, through which the railway ran into the town, lay along a naturally marked line of

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hills, was strong, furnished with three permanent forts, and numerous other semi-permanent and smaller works, well placed for mutual support, and fairly armed. The whole system was connected up by the old Chinese Wall, which formed a covered communication, and in places materially assisted the line of defence. The section west of the railway line was not so clearly defined nor so strongly fortified, and extended Northwards into a collection of hills which, though offering good positions, were not furnished with more than field fortifications. But these hills were supported by permanent forts in rear, some of which near the coast mounted guns of large calibre.

The main Japanese Army, under Marshal Oyama, was feeling its way to Liauyang, where General Kuropatkin, with the Russian Army, lay entrenched.

The Russian Fleet lay in the harbour of Port Arthur from which it had hardly attempted to stir since the beginning of the war.

The Japanese Fleet, with its base at the Elliott Islands, was keeping a close watch on Port Arthur from the sea.

Japanese Preparations:—

The Japanese at once began making the necessary preparations for the siege, such as selecting positions for batteries, for Engineer and Artillery parks, for camps, hospitals, etc., and in doing so it became obvious to them that it would be necessary to capture the hills on their left flank, Takuzan and Shokozan, which were still in the occupation of the Russians. Takuzan commanded the whole of the ground which they proposed to occupy, while Shokozan supported and flanked Takuzan; the two together not only seriously interfered with any siege operations, but threatened their left flank and line of communications to their base at Dalny.

Therefore, on the 7th-8th August, these hills were attacked, and captured after some hard fighting.

This put the Japanese in a position to commence whatever operations they considered necessary for the reduction of the fortress.

Plan of operations:—

The plan of operations decided upon was to attempt the capture of Port Arthur by a "coup de main." Imperative reasons for this decision lay in the strategical situation at the time.

(i.) The 3rd Army was urgently wanted North. The Japanese were preparing to attack the Russians at Liauyang, and the presence of 50,000 more men should ensure that the blow struck would be decisive in its effect.

(ii.) But it was impossible to leave Port Arthur merely masked or observed by a small force, as its capture was necessary in order to deny its harbour to the Russian Fleet, and force the latter to an action before it could be reinforced by the Baltic Squadron.

It seems probable that an attack by "coup de main" was included in the plan of campaign arranged by the Japanese General Staff, and, if so, General Baron Nogi was not in possession of any information that should lead him to depart from this pre-arranged plan.

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Reasons for coup de main.

On the contrary, there were reasons for causing him to contemplate its execution hopefully. They are:—

1. In 1894 the fortress had been assaulted and captured in one day, though defended by about 10,000 Chinese, with some 250 guns of all calibres.

2. General Nogi had himself been present at this capture, and had played an important part in it.

3. Up to this time in the present campaign, the Japanese had shown themselves capable of capturing strong positions from the Russians.

4. Assault seems a form of attack peculiarly suited to the disposition of the Japanese soldier.

5. There were in battery some heavy field and naval guns, and some siege howitzers and mortars that would materially assist an attack on fortifications.

6. Regular siege operations were slow, and would require the use of a heavier siege train than was at the time in front of Port Arthur. It would take time to bring up these guns.

Attack in August:—

The general attack which was to lead to the capture of Port Arthur by "coup de main" began on 19th August, and lasted to the 24th. The main attack was delivered against the Eastern section of the defences; the operations against the Metre range of hills, on the Western section, though some progress was made, were only intended as a subsidiary attack, and were not pressed. The main attack was repulsed with terrible loss, the nett result of the operations being:—

(i.) On the Western section, the capture of 174 Metre Hill.

(ii.) On the Eastern section, the capture of two redoubts, which gave the Japanese a footing for their further operations.

(iii.) A casualty roll of about 15,000; and

(iv.) Conviction brought home to General Nogi that he must have recourse to regular siege operations.

Criticism:—

The Japanese selected one of the strongest portions of the defences for their attack. The objective was the works on Bodai (or Wangtai). The reasons for this attack seem to have been:—

(i.) The Russians, having retired precipitately on 31st July, were believed to be demoralized.

(ii.) Bodai was considered to be the key of the situation, and, if captured, both town and harbour would become untenable.

(iii.) Its capture would split the Russian main defensive line in two, and isolate the forts East and West, and the Russians might consequently retire.

But, on the other hand, even if the Japanese had succeeded in getting a footing in Bodai, it is improbable that they could have held

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it in face of the artillery and rifle fire that could have been brought to bear on it from the other works on both sides, and it could only have been their ignorance of the nature and disposition of the defences that led them to indulge in such sanguine hopes.

In the light of our fuller knowledge after the event, we may with some confidence say that this attempt was foredoomed to failure; but are we therefore justified in saying that a "coup de main" should never have been attempted?

Whatever answer may be given to this question, there will probably be general agreement to this proposition—viz., that had the Japanese possessed accurate information as to the nature of the works they attacked, or their disposition for mutual support, it is unreasonable to suppose that they would have expected in 1904 to successfully storm forts with ditches and flanking galleries held by such formidable foes as the Russians, just as they had in 1894, when none of these obstacles to success existed; nor have wasted their energies in assaulting a position like Bodai, had they been aware of the immense volume of direct, flanking, and reverse fire that could be brought to bear on any close attack.

Their "intelligence" was defective, and they seem to have been quite ignorant of the nature of the Russian works, nor to have comprehended what the assault of intact permanent fortifications involved, and so the "coup de main," which, if directed on a less strongly fortified portion of the defences, might have been successful, proved a costly failure.

Whatever view may be taken of this attempt, it is certain that the result serves as another illustration of the teaching of history that only a feeble fortress, or one held by a weak and demoralized enemy, can be expected to succumb to an attack by "coup de main."

Selection of front:—

Regular siege operations were at once commenced, and powerful siege pieces and reinforcements of men demanded from Japan. Ground was broken against the Eastern section of the defences that had just been assaulted, and this front was evidently selected as the front to be attacked.

It is not easy to understand why this choice should have been made.

Perhaps it was part of the arranged plan of campaign. It seems certain that the Japanese military authorities attached great importance to Bodai as a key of the position, possession of which would give them complete command of the town and harbour of Port Arthur. Other reasons may have been:—

That they had already possession of two redoubts, East and West Banruisan, which gave them a foothold on this front.

The proximity of the railhead to this part of the theatre of operations would much simplify the difficulties of transport and supply.

On the other hand, this was the stronger section of the defence, was provided with three permanent forts, several works of a semi-permanent type, and some smaller redoubts mutually supporting each other, and all connected up by the old Chinese wall, which in many

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places had been loopholed and put into a state of defence; but the Japanese "intelligence" does not seem to have been good enough to have furnished them with any accurate information regarding the nature of the defences.

Points to be considered:—

In selecting the front for the attack, there are many considerations that a Commander has to take into account, and the only general rule that can be laid down is that the choice should be made so as to reduce the place in the least possible time, and with the least possible labour and loss.

It is therefore generally desirable to attack either—

(i.) The weakest side, that is the one that is likely to offer the least resistance, or,

(ii.) That side which, from its inherent importance, will, if captured, lead to the surrender of the place.

Whatever motives led to the siege of Port Arthur, and there were probably several, the most insistent was to deprive the Russians of a fort in which their fleet could shelter.

If the Japanese could obtain possession of a position from which accurate gun fire could be directed, or brought to bear on the harbour, this object would be effected either by the destruction of the fleet, as eventually happened, or by its expulsion from the harbour into the clutches of the Japanese squadrons waiting for it outside, as had nearly happened on 10th August.

On the Western section of the defences, 203 Metre Hill offered such a position, and the defences of this section were not so strong as those on the Eastern side. Attack of the Western section therefore fulfilled both conditions; it would be directed against:—

(i.) The weaker front of the two.

(ii.) The position of more intrinsic importance.

Although the Japanese had ten years earlier captured Port Arthur, and had then been in possession of the fortress for some time, they do not seem to have been well acquainted with the topography of the place, and to this must be attributed the small value they seem to have placed on 203 Metre Hill. At the same time, it appears that the view of the naval authorities on the method of conducting the attack on Port Arthur was, that the capture of the fortress could best be effected by attacking the N.W. front, leaving the section East of the railway alone.

This view must have been considered, and it is therefore difficult to understand why the Western section should have been disregarded, especially as it was from this side that General Nogi had successfully attacked the fortress in 1894.

Plan suggested:—

Had the Japanese operations as they were eventually carried out, been completely reversed, it is probable that they would have effected their object much sooner than they actually did, and without such a terrible loss of life as was incurred—that is, if, instead of making a

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general assault on the Eastern section, and, when repulsed, directing the main attack by regular siege process on this same front, while merely containing, or directing, a subsidiary attack against the Western section, the Japanese had in August attempted the "coup de main" against 203 Metre Hill, it is possible they might have been successful, as this position was not so strongly fortified then as later in November—December when they actually took it. In September, when this hill was first attacked, the Japanese succeeded in occupying it for a short time, had this attack been supported as strongly as were those made on the Eastern front at various times during the siege, it appears likely that they would have succeeded in holding it, and therefore it does not seem extravagant to suppose that had the main attack been directed against the Western section, 203 Metre Hill would have been in Japanese hands long before the date it was finally occupied.

The most promising plan, probably, was to direct the main attack on the Western section, while masking the Eastern section forts by pushing the attack methodically and persistently, without running any risks.

That the Japanese had enough men to have carried out regular siege operations against such an extended front as this plan of operations would have involved is, I think, evident when we remember that at the commencement of the siege they had 64,000 men, and there was a sufficient supply to bring this number up to nearly 100,000 men by the end of the siege, in spite of the fact that during the interval there had been, including sick, some 90,000 casualties. On the ordinary calculations for working parties, guards of the trenches, etc., usual in siege operations, 150,000 men would have been ample. This allows for the construction of 9,000 yards of trenches, the observation of 5,000 yards of front on the Japanese extreme left, and provides a guard of the trenches to each section sufficient to meet a sortie in force of 20,000 of the enemy.

Operations in September:—

After the failure of the "coup de main," nearly a month elapsed before any fresh attack was undertaken, during this period the Engineer works were steadily pushed against the front selected for attack.

By the middle of September the trenches against Fort Kuropatkin had reached a point within 100 yards of the crest of the glacis, and on the 19th an attack was delivered against this fort, and the cluster of redoubts South of the village of Shuishien, which supported it, and by the 20th the whole position was taken.

The capture of Fort Kuropatkin enabled the Japanese to commence a regular attack against Forts Shojusan and Niriusan, and gave them possession of one of the main water supplies of Port Arthur. This fort was an ordinary earthwork, with bomb-proof cover, but it may be noted as a proof of how ignorant the Japanese were of the nature of the Russian works, that before its capture it was credited with an enormous ditch, iron-plated caponiers, underground galleries, and other terrors.

Simultaneously with this attack, the 1st Division, on the right,

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attacked the fortified hills in their front, including 203 Metre Hill; they succeeded in capturing Namakoyama Hill, and penetrated as far as 203 Metre Hill, but could not hold it.

The result of these operations was appreciable progress; the line of the main position was straightened out across Shuishien Valley, the close attack on Forts Shojusan and Niriusan could be begun, and indirect fire upon the town and ships in the harbour could be more accurately observed.

The Japanese evidently still failed to appreciate the value of 203 Metre Hill; only one brigade was employed in the attack against it, and the reason for making an attack at all is said to have been that information had been received that the Russians were preparing to concentrate on the Liautishan Mountain, a proceeding which the Japanese wished to prevent, and hoped to observe and stop from this hill.

Operations in October:—

By the end of October the Engineer operations had so far advanced that it was determined to try another general attack. On the 26th the Russian trenches in advance of the ditches of Forts Shojusan and Niriusan were assaulted and captured, and it was then discovered that there were deep, wide ditches, and ditch defences to these forts that would make a successful assault extremely difficult. On the following days a heavy bombardment over the whole front to be attacked was kept up, and on 30th October a general attack was made on the Eastern section of the defences from the Higashi Keikwansan works, on the East to Shojusan on the North. This general assault was brought to a standstill at the edge of the ditches of the permanent works attacked, and may be said to have ended in a repulse.

Criticism:—

What is perhaps most surprising in this attempt is that, though it was only on the the 26th that the Japanese discovered the extent and nature of the ditches, and their defences which they seem to have recognised were likely to interfere with the success of the operation, they still persisted in carrying it out as arranged; they failed to recognize the importance of the great principle that the methods of attack adopted should be suited to the conditions of defence, and altered as the latter alter. In this case, it is true there were no alterations in the actual conditions of the defence, but only in the better knowledge the Japanese had obtained regarding them.

Operations in November:—

It was now necessary to wait until the mining operations could render the counterscarp, galleries, and caponiers flanking the ditches innocuous, and until the descent into the ditch had been rendered easy.

By the end of November progress in this direction was so far advanced, that it was considered desirable to try another general assault, and on the 26th the attack of 30th October was repeated, but with no greater success. The escarpment of the forts proved too strong an obstacle, and the assaults were all repulsed. This was the

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third general attack that had been made against the Eastern section of the defences in three months. In each case the assault had been vigorously carried out, the most reckless and persistent bravery had shown how determined the Japanese were to gain their object, but each attack had failed. This last and the assault in August were accompanied with terrible loss.

Operations against 203 Metre Hill:—

Foiled in this direction, it was now resolved to see what success could be obtained by pushing the attack on the Western section.

Just previous to the attack of 26th November, which they witnessed, General Kodama, the Chief of the Staff to Field-Marshal Oyama, and General Fukishima had arrived at Port Arthur, and doubtless brought with them instructions and advice to General Nogi.

The strategical situation had, from the naval point of view, become more critical; the Baltic squadron had started from Russia some two months earlier, and was on its way out to the East, and the naval authorities were pressing for consideration the importance of obtaining a position from which fire could be directed on the Russian Fleet in the harbour.

The 7th Division had just reached Port Arthur, and could furnish fresh troops for a new attack. The importance of 203 Metre Hill seems suddenly to have dawned upon General Nogi, and he decided to attack it at once.

Since the 19th September the 1st Division had been steadily pushing saps against this point, and they had now reached the foot of the hill; but there was still a formidable bit of ground, swept by rifle and machine gun fire, to be traversed before the top of the hill could be reached.

On 28th November the attack began, and by 5th December the Japanese had succeeded in effecting a lodgement on 203 Metre Hill from which the Russians could not succeed in driving them. This position was only won after repeated assaults and the most strenuous fighting on both sides, and it was not until a prolonged bombardment by 28 c.m. and other howitzers and guns had completely destroyed the whole top of the hill, and rendered it untenable, that the Japanese Infantry were able, supported by shrapnel fire and H.E .shell from the Field Artillery, which swept the reverse slopes and prevented the Russian reinforcements from coming up, to advance from their own trenches, close under the top of the hill, and finally seize the position.

This was the most important achievement of the siege up to date. The capture of 203 Metre Hill left the Russian Fleet at the mercy of the Japanese gun fire, and thus accomplished the chief object of the siege. But success was only obtained at an enormous sacrifice of life. The total casualties from 26th November to 5th December were anything from 15,000 to 20,000.

Operations in December:—

After this date the investment line on the West was gradually extended to the South, and drawn closer in towards the harbour and New Town, while on the Eastern section the mining operations

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against the escarpments of the permanent forts were steadily pushed on until, on 18th December, the mines against North Keikwansan Fort, being ready, were exploded, and the forts stormed. The attack at first hung fire, but eventually the G.O.C. of the Division, General Samejuma, personally brought up half a battalion, and flung them into the work; they succeeded in capturing the machine guns that had barred the way, and took the fort. On 28th December the mines in Fort Niriusan were blown up, and the fort stormed and captured, and on the 31st the last of the permanent forts, Fort Shojusan, was similarly attacked and captured, with little loss, owing to the Russian magazines blowing up. On 1st January, the works on Bodai, which had defied the assaults of 24th August with such terrible slaughter, were captured with little loss; and on 2nd January the articles of capitulation were signed, and the siege of Port Arthur ended.

Engineer Operations:—

The later operations of the siege were greatly dependent on the Engineer operations. I do not feel myself competent to discuss these in detail. The impression left on my mind from the accounts of the siege that I have been able to study, is that though the Sappers worked with great devotion, and showed much resource and skill, they acquired their knowledge of siege work from the experiences they gained during the siege itself, and had not been specially trained in this somewhat particular form of Engineer work.

There seems to have been an absence of that method and science that marks the Western Engineer; one seems to fail to trace the presence of a steady and capable guiding hand in the Engineer operations, and one looks in vain for the name of the Engineer of high rank who was responsible for the operations of this great siege.

General Samejuma, an officer of Engineers, was sent to Port Arthur in November presumably to conduct the Engineer operations; but on arrival there he was given the command of the 11th Division, then vacant. It does not look, therefore, as if Engineer operations were likely to be considered as important as in a siege they must always be.

In support of this view, it may be observed that the Japanese, in their eagerness and impatience, were always a stage in front of the Engineer, thus:—

(i.) In August the assault was made before any ground was broken.

(ii.) In October the forts were stormed before the Engineers had got into the ditch.

(iii.) In November, storming was again attempted before the Engineers had got over the ditch and could arrange to blow the escarps up.

This want of high direction only led to a terrible waste of human life; the fortress, in the end, was not captured until the Engineer works had been completed.

Use of Grenades and Bombs:—

A remarkable feature of the Siege was the employment by both

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sides of ancient Engineers stores, viz:— Grenades used at close quarters and with deadly effect. It appears that in the type of trench now necessary against modern gun and rifle fire and which must be dug deep, blinded, and traversed, it is impossible as a rule for an assailant to get effectively at the occupant with either bullet or bayonet, and that to turn him out he must have resort to some missile of a deadly nature that he can throw. It is probable, therefore, that the Grenade has come to stay.

Bombs thrown from small mortars planted in the trenches were used for a similar purpose, they have their prototype in the "pierriers" of a hundred years ago.

The Telephone:—

Another and new feature was the universal use made of telephones,not only were all regular communications by telephone, but the firing line was connected up with the important command posts, and information of the progress of each engagement telephoned back by a swarm of telephonists each with his own portable telephone and spare line connected up to the trench line. Messages that have been usually sent by orderly or galloper were invariably telephoned along the line, and the telephone was used to give the order or signal for putting the assaulting columns into motion.

Undoubtedly the telephone must play an all important part in future sieges and the necessity of training and practising as many men as possible, particularly of the Artillery, in this work seems obvious.

Artillery Organization:—

The Japanese Administration of the Artillery is simple and appears to have worked well. The Divisional Artillery were left under the control of Divisional Generals. All the heavier Artillery used in the Siege was under the direct control of the G.O.C. Siege Artillery who is on the Head Quarter Staff.

Fire Control:—

The system of fire control seems to have been equally simple and to have worked equally well. The G.O.C. Artillery assigned the objectives to each regiment, sometimes to a group or pair of guns, he controlled generally the rate of fire and ordered the approximate daily expenditure of ammunition. He communicated with the Artillery Regimental commanders who in their turn gave orders to the battery, company, and Group Commanders. As all communications were by telephone the G.O.C. could always be switched on to any junior commander with whom he wished to communicate directly.

Indication of targets was by Map. All Officers commanding units were supplied with a map ruled in half inch squares, numbered and lettered. On it were marked ranges, lines of fire, and arcs of fire for the gun groups concerned.

Fire Direction:—

Each officer in command of a group of two guns or more, up to the G.O.C. Artillery had his observation post which was fitted with a hyposcopic telescope for observing fire.

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The Japanese do not seem to have used any rangefinders or instruments for observing or directing fire other than Zeiss glasses or telescopes, and though their fire is generally described as accurate a careful examination of accounts seems to indicate that there was often a want of precision of fire, which in the absence of accurate instruments for directing it, is not very remarkable.

This distinction may not at first sight appear very clear, but it amounts to this:—

Whenever the Japanese fire is described as very accurate it is usually when bombarding some fort or position previous to assault, and here the rain of shells that would fall on the particular point in a given time, is apt to give an exaggerated notion of the accuracy of the fire to an observer who does not take into account the number of guns firing and the rate of fire maintained. The desired effect is no doubt produced, and the ability to cover a certain area with shells is apparent. Such fire may very properly be called accurate, but it can only be called precise when the area fired at has become very small and includes some particular objects that it is desired to hit. Now we find that on December 6th after the capture of 203 Metre Hill had enabled fire to be carefully directed, 280 rounds were fired at the Russian Ships in the harbour from the 28 c.m. (11″) Howitzers and 36 hits on five ships were obtained, and in four subsequent days 122 hits on seven ships were recorded, the number of rounds fired is not stated, but taking the same daily rate of expenditure of ammunition it must have been over 1000, this cannot be considered remarkably accurate shooting looked at from a gunner's point of view, though no doubt it was sufficiently accurate for the purpose required.

Why then it may be asked should a greater precision of fire be looked for? The answer is that a more accurate fire would have obtained the same result with a less expenditure of ammunition, and that in other cases where precision of fire was necessary to silence guns or to carry out breaching operations it was apparently not forthcoming as neither of these objects were effectually accomplished. It is true that a good many Russian guns were either disabled or dismounted by the Japanese gun fire, but these were mostly in the forts and positions subjected to general bombardment, and were probably damaged in such bombardment without fire being particularly directed on to them; up to the end of the Siege the Russians were able to bring a considerable gun fire to bear on the points attacked.

Fire direction seems to have been assisted at times by Chinese spies within the fortress; sometime before the capture of 203 Metre Hill, fire was directed at times on to the Russian ships and it was reported that several had been hit, it is difficult to understand how this fire could have been directed except by assistance from within the Fortress. The Japanese are credited with having established a regular system of signals by which they were able to obtain information as to the results of their fire from these Chinese spies in Port Arthur.

Gun Positions:—

The position selected by the Japanese for their Ordnance seem to have been admirable, they used with great judgement accidents of

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the ground, millet crops, dummy guns, and emplacements to conceal their own batteries and to deceive the enemy.

Covered emplacements were frequently made for guns even where fired from concealed positions. Indirect laying was almost universally used. The result of these careful and judicious prepartions was that the Japanese losses in men and materiel in the batteries was very small.

Employment of Artillery:—

Field gun shrapnel fire was judiciously employed in keeping down gun and rifle fire during the assaults and preventing reinforcements being brought up. A notable instance of this occurred at the capture of 203 Metre Hill on 5th December.

The employment of the heavier pieces does not seem to have been understood so well at the beginning of the Siege when direct fire only was used; but later on cross and enfilade fire was substituted, and a marked improvement became visible until towards the end of the Siege enfilade and reverse fire were freely used with great effect.

But in spite of this it is permissible to doubt whether the Japanese ever grasped the true principles of the employment of Siege Artillery fire.

In the early stages of a siege gun fire is employed:—

(i.) To subdue the defenders Artillery.

(ii.) For purposes of general destruction.

In the old days this was effected by arranging certain batteries for dealing directly with the guns on the front to be attacked, and others for using enfilade and ricochet fire against the supporting and adjoining faces.

In the later stages the batteries are employed for breaching, and silencing what guns still remain to bring a fire to bear upon the front to be assaulted. The breaching batteries and counter batteries of old times were constructed for these purposes.

Nowadays these still remain as the chief objects of Artillery fire but owing to the long range, and accurate fire of modern guns the work can usually be done without shifting the position of batteries and is generally best done by employing howitzer fire.

The Japanese seemed to have chiefly used their fire for bombardment and purposes of general destruction, and do not seem to have set to work systematically to attempt to silence all the guns that might prove troublesome, nor do they appear to have made any attempt to use their heavy howitzer fire for regular and methodical breaching operations. Similarly in supporting the assaults that were made it appears that the preliminary bombardment of the position to be attacked was generally very thorough, well executed and effective, but on one or two occasions as soon as the advance of the Infantry made it necessary to cease firing, the Japanese gunners failed to turn their fire on to the Russian guns from whose shrapnel the assaulting columns suffered severely.

Breaching:—

Again it should have been possible by a well directed fire from

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the heavy howitzers, and a sufficient expenditure of ammunition to have destroyed the counterscarp revetments of the permanent forts and opened a way into the ditch, and after to have considerably assisted the final operations by breaching the escarpments. That the Siege Artillery was not thus turned to the best account must be attributed, I think:—

(i.) To failure to comprehend correctly the principles that should govern the employment of Artillery in a Siege.

(ii.) To an inability through the want of sufficiently accurate means and a thorough technical training to produce such precision of fire as is essential to the successful accomplishment of some of the work required from the Artillery in a Siege.

Howitzer Fire:—

The experience of the Japanese at Port Arthur has led them to attach much value to the high angle fire of howitzers and mortars, and to consider gun fire against permanent works of very little use. With the exception of the 6″ Naval guns the fire from their siege guns does not seem to have been of much value.

Heavy Howitzers:—

But it was quite otherwise with the howitzer fire. The heavy 28 c.m. (11″) howitzers were invaluable; indeed, it is not saying too much to say that without them Port Arthur might never have fallen. The effect of their shell was most destructive. The Russian fortifications had not been planned to withstand anything heavier than 6″ shell, and even the permanent forts were knocked out of shape by their fire. The arrival of these enormous projectiles created consternation among the defenders, and the inability to provide against their destructive effect is assigned as one of the reasons for the capitulation of Port Arthur. The effect of their fire at the great assault on 203 Metre Hill has already been noticed; during the 8 days over which this attack lasted 1200 28 c.m. shell were fired at the Russian positions on this hill and the defences which were so formidable in September were completely destroyed. On the 16th October the 28 c.m. howitzers were used for the first time to support the Infantry attack on a small work called "G" and to the effectiveness of their fire against earth works is attributed the small number of casualties that attended the operation. The defenders were simply driven from the work by it and most of the casualties which occurred, 150 in all, were due to counter attacks made the same night by the Russians.

The Japanese were so confident in their fire effect that relying on these heavy howitzers they did not hesitate to attack on the 30th October, though they had only just discovered the formidable nature of the ditch defences they had to overcome; and yet strange to say these howitzers were never employed to breach these defences, a task for which they were well suited.

The demand for heavy pieces is almost the first articulate cry raised by the besiegers at all Sieges, the value of their fire when they have been forthcoming has always been admitted, the demonstration of their value afforded by this latest Siege is so clear and striking that it has been obviously apparent to the most uninstructed observer. It

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seems therefore a work of supererogation to point the moral, but if we were asked what is the calibre of the service heavy howitzer how many of us would know even where to look for the answer?

Night Firing:—

The Japanese do not seem to have looked with much favour on night firing, on the occasions of the great assaults there was often a heavy fire carried on, or opened at night, but on other occasions they seem to have been averse from running the risk of exposing their gun positions by fire, the flashes of the explosion being so visible by night.

This is a point worth noting and with it should be considered the following questions:—

(i.) For what purpose is night firing required in a Siege.

(ii.) And cannot all that is necessary in this line be as a rule done by lighter guns on field carriages whose positions could be easily shifted as often as their fire by night had given them away.

Value of Craters:—

As a matter of minor interest it may be noted that the Japanese in their assaults at times used the Craters formed by the 28 c.m. shell, as shelter pits, and reports also say that when occasion served such Craters were used as shelters from which with the aid of cutters secured to poles, the wire entanglements were cut.

Shell fire has always proved absolutely useless against this form of obstacle that it is pleasing to learn of a method by which it may be turned to some account. It is probable that gun fire systematically directed to such purpose would often prove of more value to an assailant than it could be when employed in that favourite method, a general bombardment.

Small Calibre Guns:—

There were several instances of small guns, mountain guns, being brought up into the trenches to fire point blank at loopholes, and even to clear the way in some close fighting that took place in the counterscarps galleries. In the later stages of the operations Field and Mountain guns, Field howitzers, and Light Q.F. guns were pushed up to quite close ranges to support attacks.

In one case a 6″ howitzer was placed in "P" work after it was captured to breach the gorge casemates of North Keikwansan Fort at a range of about 350 yards, this seems to be the only instance of the Japanese resorting to breaching operations.

These incidents show that there may be many occasions in a Siege for the useful employment of Light and handy guns that are now considered obsolete.

Machine Guns:—

The value of machine guns in the defence has been clearly proved in this Siege, many of the Japanese assaults were brought to a standstill by the annihilating effects of the fire of these guns, instances are, the attack on Bodai on the 24th August, on North Keikwansan Fort on the 18th December, on Niriusan Fort on 28th December, and

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many others, which seem to prove how invaluable these guns are when well placed in concealed positions or blindages and concentrated.

Conduct of the Defence:—

There is very little, or no first hand information obtainable as regards the defence of Port Arthur by the Russians, and we can only judge of it by the results and the progress of the Siege.

The defence throughout the Siege and up to the last fortnight seems to have been conducted with vigour and determination.

The position occupied was a strong one, and the Engineer works appear to have been skilfully planned, and executed, and certainly proved very formidable. This seems to have been due to the personal supervision of General Kondratenko, an Engineer Officer to whom much of the vigour of the defence seems due. It was not until after his death on the 16th December, that the Russians began to show signs of wavering.

Gun Positions:—

On the other hand the Artillery positions were badly chosen, the guns were generally mounted on the tops of hills or in forts, in most exposed positions, and consequently over that section of the defences which was attacked, and which was so constantly bombarded much damage was done to guns and artillery materiel, and many casualties occurred among the personnel. The Russians thus deprived themselves of a great deal of Artillery fire that might have been usefully employed in repelling the frequent assaults made by the Japanese.

The experience of Port Arthur seems to indicate that forts are no places for guns, and that the only weapons that should be placed in them are machine guns or very light Q.F. guns to repel assaults.

The Russians seem to have disposed their machine guns very well and made full use of them. Against their fire the Japanese could make no head, and it was mainly instrumental in checking all the assaults delivered. Next to machine gun fire, shrapnel fire seems to have been most effective in checking the progress of the attack. This points to a useful rôle to be played by the field guns forming the armament of Land Fronts.

Counter Attacks:—

Counter attacks were almost invariably made after each assault, sometimes a work captured would be reattacked three or four times as in the case of the Banruisan Forts in August, but without success, at other times, as on the 20th August, at Fort Kuropatkin, on the 19th September at 203 Metre Hill, the counter attack would be completely successful, but whatever the result, the attacks were always delivered with courage and determination.

Perhaps all the Russian energy was expended in this manner, for certain it is they never attempted a sortie in force, nor ever seemed to have contemplated one, and yet there should have been no difficulty in collecting 20,000 men for such a purpose, and there must have been many opportunities offering advantage to be gained by a well planned sortie.

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Conduct of Defence:—

The high courage and determination shown by the Russian soldier is an honourable feature of the defence, and deserves our admiration, but it is not likely that history will be able to afford any meed of praise to the spirit and ability exhibited by the Officers. The surrender of Port Arthur was not justified by the condition of the fortress at the time, and was distinctly contrary to the policy demanded by the strategical situation, and in pronouncing it premature, history will undoubtedly hold the Commander and his Officers responsible for the want of that higher courage and determination that renders even an unsuccessful defence glorious and honourable.

Conduct of Attack—

The higher direction of the attack cannot be considered as a model of how Siege operations should be conducted.

The want of experience and the absence of any Military traditions of Siege warfare probably account for the noncomprehension of the principles regulating the conduct of siege operations.

To this must be added ignorance of the nature and disposition of the fortifications attacked which led to unsuitable methods of attack being attempted. While the impetuosity that was constantly anticipating the Engineer operations by rushing to open assault served no purpose but to swell the casualty list.

The operations, however, were rescued from failure, redeemed from blunder, and glorified into a magnificient feat of arms by the indomitable bravery and splendid soldierly qualities displayed by the Officers and men of the 3rd Japanese Army, and to some of the most noteworthy of the reckless assaults of this army may fitly be applied the famous criticism bestowed by the French on another smaller but brilliant feat of arms " C'est magnifique mais ce n'est pas la guerre."

Lessons of the Siege:—

From the contemplation of these heroic deeds, the little real advantage gained by the appalling sacrifice of life they entailed, and from a study of the methods that eventually achieved success we may derive two great lessons of this Siege, viz:—

(i.) That now more than ever, but as always, the capture of a properly fortified fortress defended by good troops, can only be effected by resort to regular Siege operations involving the expenditure of much time, material, and labour, operations in which the art of the Engineer, and the skill of the gunner must first prepare, and make possible the Infantry assault by which alone final success can be achieved.

(ii.) That this being so, it behoves the Officers of every Army to comprehend the principles and methods of Siege Warfare, and to make themselves acquainted with what the limitations of the different arms are, so that they may not through ignorance be led to embark on operations that must by the circumstances of the case be foredoomed to failure.

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Life and Recreation in Sierra Leone.

By CAPTAIN C. E. PALMER, D.S.O., R.F.A.

ONE way and another a good many gunners put in a tour, or tours, of service at Sierra Leone, and as the stigma of the "White man's grave" still, to a modified extent, clings to it in the minds of the uninformed, it may serve a useful purpose to draw attention to the alleviations which are obtainable in the way of sport, especially as sickness of all kinds there, as in other tropical places, is rapidly induced by idleness and boredom.

It must be acknowledged that opportunities to travel far in search of sport vary considerably with the nature of the official employment in which one is engaged. Gunners may be there as R.G.A. with the British company, or with the West Indian and Local companies, or seconded to the West African Regiment or West African Frontier Force. Staff employment and Ordnance Department may send a few there. For those at Regimental duty refuge from the restricted amusements available in Freetown can only be obtained by the two months' leave allowed, but those who can get it at the right time of year, as I shall show below, will, if they are anything of sportsmen, never regret an expedition into the Protectorate which, if organized with common sense, will serve as well or better than a trip to the Canary Islands to brace mind and body and afford a wild healthy life and opportunities of sport which will put in the shade anything that the fleshpots of Las Palmas can provide.

Of the West African Regiment about a quarter is stationed in the Protectorate and the officers get, within the brief limits of "Station leave," some good opportunities of shooting and fishing.

The West African Frontier Force is wholly stationed in the "Bush" (i.e. the Protectorate), and its officers obtain especial chances of getting sport, as the conduct of patrols into the most outlying parts forms a frequent and important portion of their duties.

Departmental officers can practically never get away for long enough to get good sport, but the Staff Officer charged with the Intelligence duties will always find it necessary to do a certain amount of travel through good country.

The possibilities of Freetown itself may be dismissed in a few words. Lawn tennis is looking up and, with the new court at the Club now in the making, should flourish. Cricket and hockey drag out a somewhat precarious existence depending on the number of individuals who will adhere to these games in a climate which, especially for the latter, is rather trying. The sea-fishing is contemp-

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tible and will continue so unless a star shall arise who will show the way to circumvent the local tarpon *(Elops Saurus* or *lacesta)* and the elusive barracouta which are the only two kinds of really sporting sea-fish in the harbour. The efforts of enthusiasts during the last five years (quorum pars fui) have resulted in failure. Boating, owing to violent tides, has never proved a success. The shooting is restricted to week-end trips, either by boat two hours across the river-mouth to Bullom where 8 to 12 brace of bushfowl may be got in March when the young birds are strong, and a few spur-winged geese in November and December; or by rail up the Government line to various stations within a few hours run where, with luck, a similar number of bushfowl may be got. Something more than a week-end is needed to go far enough up the railway to strike the big rivers, such as Mano, Sewa, and Moa, and to enjoy the fresh-water fishing; but that comes more suitably under the head of the Protectorate or "Bush," to which we will now proceed.

It will be as well to understand, in the first place, that the country of the Protectorate may be roughly divided by a line drawn from Kambia in the West to Kanre Lahun in the East, both of which places are marked in all maps of any practical scale, and that South of this line is "bush" country covered with a dense growth 10 to 20 feet high, and North of it is "grass" country. It is the latter which provides the shooting as well as good fishing.

The railway throughout its course adheres to the bush country, but as it runs nearly parallel to the Northern edge of it, any station in it may be regarded as a possible starting point for the North, and where it cuts the big rivers good fishing may be had.

The game procurable in the North consist of Elephants, Hippopotamus, Bush cow (wild cattle), Antelopes, viz: Colus Cob (common), Water buck, West African Harnessed Antelope and Bongo (both rare), Bush buck, duikers and several smaller species; of sundries Leopards are innumerable and run large, but are very hard to get as they are mostly in dense cover, the red river-hog is ubiquitous, in the Eastern bush-rivers the pigmy Hippopotamus exists and in the extreme North there are wolves, which I mention as where they are there is no game. The birds are Bushfowl (plenty), Guinea-fowl, Lesser Bustard and a few Paaw or Greater Bustard in March, April, May; geese, duck and snipe are all rare and very local and only found from November to February; the larger doves are good eating and worth a cartridge for a change of diet; quail occur occasionally.

The country rises to the North and North-East and becomes hilly and broken in parts. Everywhere it is well watered, the larger rivers holding good fish for sport and table.

The Elephant-grass with which the Northern half is covered is, at its full growth, even more impenetrable than the "bush" of the Southern half, it is therefore impossible to shoot game when such conditions prevail. Fortunately, however, the natives, in order to make their rice-farms, have to burn the grass both to clear the ground and to manure it with the ashes. These grass-fires frequently extend far beyond the area required for farming, as might be expected when the grass stretches unbroken for 20 or 30 miles. Besides such fires

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the hunting men, who rely on the meat they can shoot for their livelihood, fire the grass at likely places for game, so that they may be able to see the animals and also that the latter may be attracted to such areas by the fresh young grass that springs up after the fire. These fires are usually lighted from February to April according to the prevailing dryness of the grass in the different localities and to the absence or otherwise of rain.

A few showers fall in May heralding the rains of June and July and onwards, and under their influence a new crop springs up rapidly and by the end of July is too high to see over.

It is therefore from April to July that the country is workable, and June is the cream of that period. In April and May long stretches of drought may make tracking and the noiseless approach of game very difficult, and in July the high grass and frequent downpours render long days in the field trying and wet for any but the hardiest sportsman.

As regards locality, in the North-East corner of the Protectorate, 25 miles from the North boundary and the same distance from the West boundary, you are in the heart of the elephant, hippopotamus and bush cow country, with antelopes all round. Keep to the rivers for game as a rule. To get there go by big canoe to Port Lokkoh, 24 hours, £3; and five good marches will take you there. Carriers are 9d. a day each, or 1/- if taken from Freetown. A man's load is 65lb. Make a point of meeting the District Commissioner and make friends with him, a little courtesy in these matters will carry you far. If he will send word of your coming and route in front of you the matter of labour and supplies will be simplified. Take a soldier servant with you, it will do him good and impress your official position on the native. Get an old W.A.R., or W.A.F.F. discharged soldier as guide, interpreter and tracker, there are many good ones to be got by enquiries and they should take 25/- a month and their food, but see that he knows the country and the language of the part you visit; there are four main languages in the North of the Protectorate. A local man from the village should accompany you shooting as he will know the best paths and the lie of the land.

If your battery is not up to elephant (of which more anon) go two-thirds up the line and march to the North of the Panguma District and shoot buck and bush cow, but remember that the latter take a lot of stopping when wounded and are cunning and vicious.

Dont go after elephants or bush cow with nothing heavier than a ·303 rifle, it is dangerous and unsportsmanlike and leads either to foolhardy risks or abandoning wounded game. In selecting a rifle for big game take the heaviest "stopper" that you can carry *yourself* on a 3-hours' track of a wounded elephant. For most people a single ·450 or ·476 Cordite is heavy enough. It is better to have a single ·450 in your hand with an elephant coming down on you than a double ·600 in the hands of a lagging follower behind you.

Get *close* to your elephants before shooting and make certain of a deadly shot and save labour and disappointment. The risk is no greater as the shock distracts his attention and he either falls or bolts. Fifteen to twenty yards is quite far enough off. I have never fired

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a first shot at one farther off than the latter. When well hit give him twenty minutes by the watch before following, he will then "stand" quicker and be less dangerous to approach. Read a book or two on the subject before trying and you will make fewer mistakes, but always remember that the wind is everything, and that solitary or packed bulls carry better ivory and are more easily approached than those running with cows in the herd.

A license to shoot two elephants (bulls only) and two hippopotamus costs £5 for officers residing on duty and £25 for visitors.

When travelling in the Protectorate it is usual not to take a tent but to sleep in the native houses, selecting "barries" or open sheds without walls when possible for the sake of air and cleanliness. By this plan you save two carriers, as a double-fly would be essential in the rains and too small a tent would be unsuited to the hot climate. Officials travelling on duty claim a house free from the headman of the village, but officers on leave should pay 1/- or 2/- for the use of a house I think.

All supplies are obtained from the head man on payment, and your carriers should fetch wood and water before they scatter. The supplies usually procurable are fowls, eggs, sheep, goats, cattle and course native vegetables. See that your cook knows how to make bread, the palm-wine of the country is a first-rate yeast. All the necessary tinned stores must be taken from Freetown where a good variety is procurable.

A hammock, slung to a "roof," looks and sounds a clumsy and unnecessary thing to carry about, but it is, to my mind, an essential in case of sickness, and should always be taken, one man can carry it and three more be got for it if you want to use it.

Never forget your fishing rod and tackle, it will give you many a good off-day and a welcome change of diet at any of the big rivers. Spinning with natural bait and bottom fishing with worms, &c., are the most paying methods, the former from a canoe in the evening.

Though not able to speak from experience of the other West African Colonies, I have had many opportunities of discussing their respective sporting possibilities with officials who have resided in them, and I have no hesitation in affirming that Sierra Leone offers greater attractions in this respect than any other. Northern Nigeria, so generally popular for other reasons whilst affording good sport in scattered places, is not generally, in the readily accessible portions, a good sporting country, and the expenses there are considerably higher than in Sierra Leone for the W.A.F.F. officers, especially those stationed at Head Quarters.

I trust that these notes may be instrumental in showing that Sierra Leone is better than its reputation, and that they may be useful in guiding others to a healthy and manly form of relaxation from duty which will, I hope, send them back to England, as in the writer's case, after a few years out there, not only physically fit but with lively recollections of many a good day in the wilds with rifle, rod, and gun.

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Landings against Coast Fortresses and the rôle of Movable Armament.

By CAPTAIN G. G. THATCHER, R.G.A.

Nature of attack expected:—

AT various periods we have suffered from scares on the subject of invasion and are not altogether immune from them now; still it is pretty well accepted that this country is defended, not on her own shores, but in the Atlantic, the North Sea, and the Mediterranean, and that our frontier is the enemy's coast line.

This gives no guarantee that our coast fortresses will never be attacked from the land side by comparatively small forces, the damage done by whom, if successful, might in some cases compensate for their total loss themselves, just as a destroyer division attacking battleships in a harbour is quite prepared to sacrifice itself provided it can effect its object, and that the nation to which it belongs has an adequate reserve of such craft. Against this last form of attack our defence is at present fairly efficient, but against the raid by land the preparations for defence have not gone on at quite the same pace. In the case of our various naval bases and coaling stations, &c., outside Great Britain, the attack by land is more likely than in the case of home fortresses, and with the reduction of garrisons now going on, tends to become more likely still. History goes to prove that it is the only form of attack with any reasonable chance of success, the usual procedure being first the seizure of some ill-defended smooth water anchorage which can generally be found in the vicinity of a fortress, then the advance overland, the navy blocking the mouth of the harbour; and finally the assault, the navy contributing a bombardment by way of a diversion.

Examples:—

Some examples of this form of enterprise are:—

The various attacks on Minorca in 1708, 1756, 1781, and 1798; in each case a sheltered anchorage at a distance from the main objective (Fort St. Philip) was sought for to disembark the troops for its reduction.

The capture of Louisberg from the French in 1745 and 1758; at this place there were elaborate defences seawards, but an obvious landing place for an attacking force four miles off was left undefended.

The capture of Fort Fisher, one of the last of the Federal combined operations in the American Civil War. This place was first

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attacked by an explosive vessel with no result; then by a large naval force which was repulsed; lastly and successfully by a landed force of 8,000 men operating from the rear, assisted by a frontal naval attack.

This sort of attack is successful only when, for some reason, there is no real co-operation in defence between the navy and the land forces. If a nation designs to send an expedition across sea to attack a place, the first thing to be thought of is a clear sea to cross. When co-operation in defence exists, the attacking nation has to settle, (1). What force is necessary to overcome the defence after landing, and, (2). The time the navy co-operating with them will allow them. The ideal defence of course is a supreme navy, so that the first essential, namely a clear sea for the attackers to cross may never be allowed them, but no fleet can, against a combination of powers each possessing an efficient navy, guarantee to close the sea ways to all points of the Empire.

During the Crimean War, all the Russian warships were effectually bottled up, and therefore there was never any fear for any of our ports. During the Franco-German War the French employed the same bottling process, and it was very effectively carried out at Santiago in the Spanish-American War, without, however, by any means entirely banishing uneasiness in the sea towns of the United States. The latest example of course is the bottling of the Russian fleet in Port Arthur, but it can hardly be expected that such an easy bottling process will fall to the lot of our navy in our next war.

In 1779, when the American revolution began, when we were also at war with France and Spain, one of the opening scenes was the appearance of a Franco-Spanish fleet of 66 ships off Plymouth; a French army had been prepared for a descent on our coast, but all that actually happened was that they anchored a few frigates in Cawsand Bay and captured a few coasting vessels, for they were being watched by 37 British ships under Sir Charles Hardy, and co-operation in defence existed.

In 1805, Napoleon planned an invasion of the West Indies by two squadrons starting from Toulon and Brest. They were being watched by Nelson and Cornwallis; one squadron evaded Nelson temporarily but was afterwards caught by him, and the other never evaded Cornwallis at all, so that in this case again co-operation in defence saved the situation.

Manœuvres:—

As regards manœuvres carried out to practise the landing of an attacking force in the face of an enemy, or within his reach, there is not much to help us. Our own landing on the Essex coast was carried out unopposed, and under favourable weather conditions. In 1902 the Americans carried out some combined manœuvres to test the defences of New York; a battleship of the attacking side bombarded a field battery defending Montauk, landed ten boat loads of marines and captured the place; it was an important point, having deep water approaches, heights commanding Gardner's Bay and Long Island, and being the Eastern terminus of the Long Island railway,

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but was only tenable with naval co-operation. A few days later a battleship bombarded the forts at the entrance to Narragausett Bay and landed a force to capture Fort Fisher, but the umpires ruled that their transport had been sunk, and the landing force annihilated by field artillery and machine guns.

Royal Commissions—

The question of the preparedness of our two great naval bases, Portsmouth and Plymouth, has twice been discussed by Royal Commissions, the first of which sat in 1789 and was given as a basis the temporary absence of the Channel Fleet, and a hostile force of 30,000 men with 30 days clear to act in; it was decided that such an attack was impossible, and that the navy could not fail to co-operate in that time. The second Commission sat in 1859, and the outcome of their labours was the provision of chains of permanent land fortification, the troops to man which were apparently to be extemporised when occasion should arise. Although ancient history, the decisions of these commissions are interesting as showing the swing of opinion on this subject. The result of too great a predeliction for fortified positions has been demonstrated in the Russo-Japanese War.

Choice of landing place:—

The attacking force may attempt to land actually within the zone of defence of the fortress, where he can be resisted whilst in the act of landing by the field force of the garrison, but he is much more likely to select some point at a distance along the coast and to endeavour to land at any rate a covering force before any resistance is felt. As regards the actual landing itself, the advantages of carrying this out in smooth water, and with facilities of sorts in the way of piers, &c., are so great that a point affording such facilities will always be sought for, even if at a considerable distance from the main objective. Landings on exposed coasts are just as difficult as ever they were, though they can be more quickly carried out now-a-days by using steam pinnaces for towing boat loads of troops, but a landing on an open beach will only be carried out as a last resource. An example of such a landing is that for the attack on Alexandria in 1805, which was delayed for some days by the weather, a delay which the defenders, being unenterprising fortunately for us did not take advantage of, and the landing was carried out with little opposition; in this case the operation of landing had been thoroughly practised beforehand at Marmorice Bay where the fleet and transports had first rendezvoused.

Rôle of the artillery defence—

From the above it would appear that the most likely rôle for the movable armament of a home coast fortress will be, in conjunction with the infantry, to stop an attacking force advancing across country against it. The armament provided for this purpose usually consists of 4·7″ and 15 Pr. guns, together with 5″ and 6″ howitzers, i.e. the arms of 3 branches of the Royal Artillery. The 4·7″—a member of the class which used to be called guns of position, i.e. guns which are not expected to make changes of position during the day—would

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probably be almost as permanent as the fixed armament of the coast defence, but would be provided with more than one position, with means of shifting from one position to another; these positions would ordinarily be for direct fire—indirect fire might sometimes be employed but would be the exception; the positions would have to be concealed as much as possible, and cover provided; whether they are for four-gun batteries, sections, or single guns, will depend on local considerations.

The field guns would also normally employ direct fire, and if there are places where a landing might be attempted within the reach of the field force of the fortress, positions should be selected and prepared for them to cover such places,even if they have to be pushed out close to the shore; they would rely for protection from the fire of supporting ships or concealment, i.e. complete concealment up to the time they open fire, and as much as possible afterwards; in this connection, the navy admit that fire from ships against properly entrenched infantry would be almost innocuous, and light field guns with unlimited time at their disposal for preparation, should be able to establish themselves in positions fairly safe from such fire. During the Spanish-American War the only shore guns to do any damage were some ancient field pieces at Matanzas in a wood, which were never located by the ships. These guns would not, of course, aspire to the mobility of field batteries, but should be capable of fairly rapid movement from one position to another, and should be able to get into position without exposing themselves.

As regards the howitzers, the 5″ has a weight behind the team of 43 cwt., or nearly half as much again as the 15 Pounder, still the battery under Colonel Hamilton Gordon in South Africa is stated to have shown little inferiority to the field guns in getting about over the country out there. These pieces appear to me to be somewhat out of place in the movable armament of a coast fortress; the rôle of howitzers in the field is the attack of trenches and reverse slopes, they are little good against troops in motion, and cannot defend themselves, whilst as for shelling ships supporting a landing or bombarding from a position not covered by the guns of the coast defences, this would be more effectively carried out by the more powerful 6″ howitzer. As, however, they exist as part of fortress movable armament, a use could be found for them in attacking ships as above mentioned, in bringing indirect fire to bear on troops approaching the shore, or just after landing, and, in the case of a force advancing across country on certain selected points in that advance, the best positions being those from which the B.C. can observe the fire himself while still commanding his battery, communicating orders by megaphone, semaphore, or field telephone. Ranges, lines of fire, and angles of sight from these positions should, as far as possible be worked out beforehand and recorded. It is somewhat difficult to lay down exactly what the rôle of the 6″ howitzer would be; it is essentially a weapon of attack, and it is hardly likely that a hostile force such as is being considered would establish themselves in a fortified position. Against hostile ships lying in waters uncovered by the heavy guns of the coast defences they could be employed in some cases as high-angle

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batteries; they might also be used to bring indirect fire to bear on any points within reach along the coast which might be made use of as landing places. In the case of a purely land attack, if the attackers have guns with them, the positions they will probably be employed in should be pretty well known to the defenders, and, having the ranges, &c., worked out and recorded, 6″ howitzers should be able to give them a warm time; otherwise their only chance would appear to be to have ranges and lines of fire to various objects of interest in the countryside worked out and recorded, and to lie low till they get an opportunity. As with the 5″ howitzers, the positions will always be the better for giving the B.C. an opportunity of carrying out observation himself, as the targets will probably be of a somewhat fleeting nature, but positions for observers to the front and flanks may have to be selected and arrangements made for communicating with them. It can hardly be expected that the personnel of these 6″ howitzer batteries should be trained to the pitch of a regular siege company, but they should be capable of picking up their line of fire from the front, rear, or flank, or by measured angle from some prominent object on a chart, and of carrying out ordinary observation of fire from flanks with or without instruments. In selecting positions for these howitzers, it is almost superfluous to say that their want of mobility must be thought of, and if there are alternative positions, the routes between them should be good or capable of being made so.

Traction:—

Regarding the method of moving the heavy guns and howitzers about, I do not know whether any provision is usually made in home defence schemes for ear-marking local traction engines for the purpose in the same way that certain tugs are ear-marked for conveying troops and stores about on mobilization. Horses, of course, are provided for under an agreement with a contractor, who provides also drivers and harness, and there seems no reason why traction engines should not be secured on the same principle; they would be very useful for general coolie work when not employed dragging guns about.

Drill-book references:—

"Garrison Artillery Training," Vol. I., 1905, lays down that for the land front of a fortress section a map should be prepared to record the arcs of fire and effective ranges of all guns mounted (?) for land defence, the distances to all prominent and important points, and the sites for works or positions decided on for the movable armament under various conditions," and also that "the positions which can be occupied most advantageously, from a tactical point of view, by the guns of the movable armament should be carefully studied, and the proposed disposition of them and their organization worked out and recorded"; for further details one is referred to "Siege and Heavy Artillery Training," since superceded by "Garrison Artillery Training," Vol. II., 1906, and "Field Artillery Training." "Heavy Artillery Training," 1904, devoted a page to the subject and laid down some general principles, such as:— That the first duty will be to try and prevent the enemy landing in boats, the necessity of screen-

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ing the guns effecting this, and the general unsuitability of indirect fire unless the attackers have guns; the utility of the movable armament at night is also questioned, owing to the targets not being illuminated, and the flash of discharge being liable to give away their positions to supporting ships; the last remark, however, would not apply in the case of indirect fire being brought to bear at night on landing places and the approaches to them; landing in the dark would be a difficult enough job in itself, and would not be helped on at all by shells dropping around, although the actual damage might not be very great; there is no reasons why preparations for carrying out such night firing should not be carried out by day.

"Garrison Artillery Training," Vol. II., 1906, goes fully into the questions of fire dicipline, methods of laying, ranging, and picking up the line of fire, but from Chapter XIV. dealing with "Selection of a Position." one would be led to imagine the movable armament moving about the country in brigades; this can hardly be intended, though doubtless it would afford much more congenial employment than being chained to one set of positions. Given a definite object to defend, the positions for the artillery of the defence to meet any possible form of attack can be settled at our leisure, and the necessity for the "brigade commanders'" reconnaissance described in this chapter does not come in.

Section schemes:—

No mention is made in the books of schemes being prepared beforehand for the guidance of individual officers who will on mobilization take command of sections or batteries of this armament, but such schemes appear to be quite as necessary as Fort Record Books. Each section of a fortress should have its own scheme for defence against this form of attack, which should include such particulars as:— Site of each position selected for the different natures of armament; routes to the positions, between alternative ones, and what will have to be done in the way of improving these routes; nature of cover to be constructed; positions for observing parties; likely lines of advance for the attack; positions and nature of expense magazines, and of one or more central magazines; housing or bivouacing of detachments; stabling or picketing of horses; manning detail; provision made in the general defence scheme for supply of horses and traction engines; entrenching tools available and where to be obtained; night dispositions; communications with adjacent sections. These schemes should be freely communicated to, and discussed by the officers who will have to carry them out, and from them should be compiled small "fighting books" for each nature of armament, containing, in addition such information as:— ranges from the selected positions to prominent objects; information for enabling indirect fire to be switched on; instructions under the following headings:— Rations and forage, conservancy, signalling, field cooking, medical, &c. Each book should contain a map of the whole section. Schemes of this sort are all the more necessary when the movable armament is manned on mobilization by militia or volunteers, some of whom may possibly never have seen the ground

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they will be working on, and their existence would not prevent improvements being made, more information obtained, and more positions selected and prepared as things settle down after mobilization.

Training:—

There will be wide differences in the degree to which the personnel manning movable armament in different places has been trained, according to whether it consists of regulars, militia or volunteers, and what facilities exist for drill and practice. It is a job best suited to "localised" troops, i.e. men who know the surrounding country and have plenty of opportunities for studying it, but in many cases Auxiliary Corps have to be employed who see nothing of the ground on which they will have to work except during their annual training, and very little then. Whatever units are employed should have their sub-units permanently told off to one of the classes of armament, and should carry out its practice from that nature. A unit told off to man 6" howitzers need not conclude that they must necesssarily follow Siege Artillery methods; the actual methods which they do employ will depend on local considerations, and the nature of appliances available; lines of fire for instance could usually be picked up from a chart if prepared beforehand, but a battery should also be capable of picking up the line without this assistance, and given some aiming posts, a rangefinder and a pocket sextant there should be no difficulty even if observation of fire instruments, directors, and field plotters are not available.

The supply of specialists (range-takers, observers, and signallers) will be a difficulty in the case of militia and volunteers. A certain amount of specialist training can be carried out during militia training and by volunteers all the year round provided they are supplied with the necessary appliances, which is usually not the case. To supplement this, there should be an establishment of movable armament specialists in the R.G.A. at every home fortress, and these men should be placed at the disposal of O.C's Auxiliary Corps as instructors during training.

The training of the officers of Auxiliary Corps should include the study of the ground over which they will be operating on mobilization, and also of the ground the enemy would operate on. The absence of land ranges is a handicap, which may some day be removed; in the meantime there are few places where observation of fire and ranging practice with puffs cannot be carried out. Manœuvring ground is usually not available, and generally the work of this branch of the R.G.A. is carried out at a disadvantage compared with the purely coast branch, and yet it is of equal importance.

Summary:—

To make the movable armament of a fortress as efficient as possible, without any further assistance than we get at present, the following at any rate can be carried out:—

(1). Preparation of section schemes in detail (not to be treated as secret) and of "fighting books."

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(2). Thorough study of the ground to be occupied, and of the methods of fire suitable to it.

(3). Likewise the ground over which the attack will have to be made.

(4). Training of specialists.

(5). If positions and communications are not to be made during peace-time, the settling in detail of what will have to be done on mobilization.

THE SUN AS AN AIMING POINT.

By MAJOR A. L. WALKER, R.F.A.

BEING rather impressed with the Jap's idea of using the sun as an aiming point, I have used a sun-dial on my guns at practice and found it both quick and accurate.

The dial is simply a six-inch disc—graduated 0° to 180° both ways—placed on the gun arc, 0° towards breech, 180° towards muzzle; kept in its place by two small projecting pins underneath,—on the 90°—90° line—which fit into two of the gun arc graduation holes. My wheeler made them up—one for each gun—of half inch wood, using a piece of bicycle wheel spoke for throwing a shadow from the centre.

Angles to right of the sun are read off on right of 0°—180° line; those to left of sun, on left of this line.

To measure the angle, Sun—director—target, put up director 0° towards sun—clamp outer, unclamp inner screw—move director till shadow of the "sight" falls exactly on to its "bed."Clamp inner, unclamp outer screw; swing director on to the target, and read off the angle. But remember that graduations to left of 0° are right of sun—to right of 0° are left of sun.

Of course it is necessary to have the dial horizontal—or very approximately so—and the "shadow-needle" vertical.

The scheme is absolutely simple, and, it appears to me, could be easily applied to any gun, especially those provided with a goniometric sight.

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ARTILLERY PATROLS

By LIEUT. J. A. DANE, R.F.A.

VERY little is said in Field Artillery Training about Artillery Patrols, and what there is, is distributed in various paragraphs throughout the book.

The present paper is an attempt to consider the subject as a whole, and to set down some suggestions that occurred to the writer during the summer training of 1906.

It is necessary to define the duties of these patrols before their training can be touched on.

DUTIES.

It appears desirable to divide Artillery Patrols into two sections:—

1. Brigade Patrols.
2. Battery Patrols.

BRIGADE PATROLS.

Communication:—

The duty of maintaining communication by mounted orderly (S. 64 (iii.) F.A.T.) will be performed by the Brigade Patrols.

For this purpose one patrol per brigade will be detailed to act as orderly to the C.R.A. of the Division. The Brigade Commander will require one patrol for each of his batteries.

Reconnaissance:—

Two patrols should be permanently at the disposal of the Brigade Commander for reconnaissance work. They will be the "selected men" mentioned in S. 52 (ii.) F.A.T., and will accompany the officer detailed to make any reconnaissance that may be ordered.

Case where the Brigade is "protected":—

We shall first deal with the case where the Brigade is protected by other troops during the time it is coming into action.

After the batteries are in action 2 of the Battery Patrols from each battery will join the Brigade Staff.

Those with the Brigade Reconnaissance Patrols will carry out the following duties under the direction of the Adjutant.

Reconnoitring and watching ground in the vicinity of the batteries to assist in assuring their safety.

Reconnoitring the enemy's position, and observing the effect of fire from positions often in advance of the battery and Brigade observing stations.

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Watching and reporting progress of friendly troops, particularly in the attack.

Reconnoitring lines of advance and retirement, watering places, &c.

Case where the Brigade is not "protected":—

In cases where the protection of the brigade is not amply provided for before it comes into action, the Brigade Commander will order two Battery Patrols from each battery to join his Staff from the outset.

These with the Brigade Reconnaissance Patrols will act as suggested above, paying particular attention to "reconnoitring and watching ground in the vicinity of batteries to assist in ensuring their safety.

BATTERY PATROLS.

Case where the Battery is "protected":—

Dealing first with the case where the battery is protected by other troops, we find that during the time it is coming into action the duties of the patrols are two-fold:—

1. To assist in bringing the battery into action.
2. To establish a look-out post in the neighbourhood of the probable position of the battery as early as possible.

The Battery Patrols are accordingly divided into two parties consisting of two each.

Patrols referred to in (1):—

The duties of the Patrols referred to in (1) above are as follows.

(a). Case where the Battery Commander (hereafter referred to as the B.C.) goes on to reconnoitre in an intersected country, where movement of guns is to a large extent confined to the roads, and where the Battery Leader is told that the battery is not to follow the B.C.

The Battery Leader may be told to await orders, or to himself keep touch with the B.C. whilst the battery comes on by a less exposed route.

In either case the B.C. brings the two patrols with him, and when he has decided where he wants the battery brought he sends them back with orders to the Battery Leader. They should "take stock" of the country so as to be able to inform the Battery Leader which is the best road for the battery to follow. In this connection tactical considerations must not be lost sight of.

During the advance they may be employed by the Battery Leader as Ground Scouts. In this case it will not be necessary for the Battery Serjeant Major to be sent to guide the Battery Leader as directed in S. 68 (ii.) F.A.T. He will be more usefully employed assisting the B.C.

(b). Case where the country admits of the battery following the B.C.

This is the case dealt with in the earlier paragraphs of S. 63 F.A.T. The battery follows straight behind the Battery Leader who as a rule himself keeps touch with the B.C.

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The two patrols remain with the Battery Leader and act as Ground Scouts.

When it appears necessary for the B.C. to keep touch with the battery he will do so by means of mounted men.

In this case, if the occupation of the position is deliberate, the Battery Serjeant Major must be sent to guide the Battery Leader to the covered position. (S. 68 (ii.) F.A.T.).

In both cases (a) and (b) as soon as the battery is in action these two patrols will be told to report themselves to the Adjutant. Until the battery changes its position they will remain under his orders.

Patrols referred to in (2):—

The duties of the patrols referred in (2) above are as follows.

It is most important that a look-out post should be established at the earliest possible moment, especially so when the battery is in a "position of readiness" and the B.C. is still reconnoitring.

Accordingly these two patrols go with the B.C., who will direct them to the best position in the neighbourhood from which the surrounding country can be observed.

One patrol looks out, whilst the other couples the horses and keeps up communication with the battery.

As soon as the B.C's post in action is established they will be ordered to come in to it, should it not coincide with their existing position.

During the time the battery is in action they will assist the B.C. in watching the movements of hostile and friendly troops, but they will not be used to observe the fall of the shell. (S. 42 F.A.T.).

Case where the Battery is not "protected":—

In the case where the battery is not amply protected by other troops the two patrols mentioned in (1) above will join the Brigade Staff from the outset and will not be at the disposal of the B.C.

Of the 2 remaining Battery Patrols, one will assist to bring the battery into action as described on p. 54, cases (a) and (b), and will then act as look-out man.

The other will act as look-out man from the beginning. A mounted man may have to be detailed to look after this patrol's horse and to keep up communication with the battery.

An additional number of men in the battery, perhaps those under training as patrols, should be trained as Ground Scouts and will act as such under these circumstances. When not so employed they will be used as coverers, &c.

Change of position:—

When a battery receives orders to change its position, the two Battery Patrols with the Brigade Staff will be ordered to rejoin as speedily as possible.

If they are on a distant mission, and the patrols of a battery which is not likely to move are within reach, there is no reason why the latter should not be attached temporarily to the "moving" battery.

If the Brigade Commander considers that neither of these courses are desirable, the B.C. should be so informed. The battery will then

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go on with only two patrols, and the procedure suggested in the last paragraph (case where the battery is not " protected ") carried out.

Case of a detached battery:—

When a battery is detached from the brigade but is still under the orders of the Brigade Commander its Brigade Patrols will remain with the Brigade Staff. All the Battery Patrols will, however, perform their duties under the orders of the B.C.

When a battery is acting independently *all* its patrols go with it, and will be employed under the orders of the B.C. on the lines suggested above.

TRAINING.

All patrols should receive the same training and will be interchangeable.

The course of training recommended by Colonel C. N. Simpson, R.F.A., in his book " The Eyes and Ears of the Artillery," covers all the subjects that an Artillery Patrol should be instructed in.

ESTABLISHMENT.

From the above description of the duties that will devolve on Artillery Patrols it is seen that Section 1. (the Brigade Patrols) will absorb 6 men, and that Section 2. (the Battery Patrols), will take another 4 per battery.

Consequently the numbers required will be 6 per Field (gun) Battery.

This does not include the mounted orderlies who must be furnished by the Brigade Ammunition Column. They are not dealt with since they will only be employed in connection with ammunition supply, and will not be interchangeable with the Brigade and Battery Patrols.

In the present state of uncertainty as to the War Establishments of brigades and batteries, it is impossible to see how the establishment here recommended will fit in with the numbers of men and horses available.

It must be borne in mind that mounted orderlies and look-out men are not at present classed as patrols, and that consequently the increase is more apparent than real.

It may be argued that when the brigade is protected by other troops the number of patrols proposed is excessive. This may be the case, but we should be prepared with the number necessary to secure safety when it is not otherwise provided for. If we are not, makeshift arrangements will have to be resorted to, which can never be considered satisfactory.

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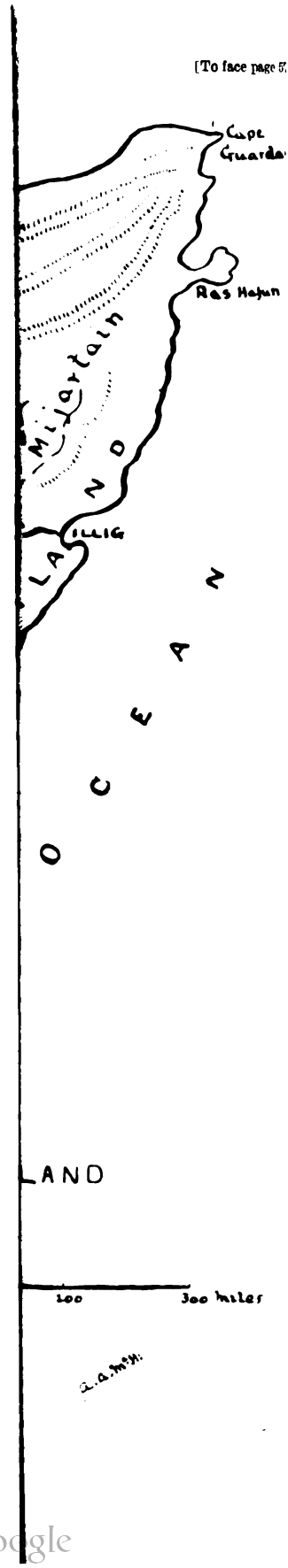

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Somaliland and its "Mad Mullah."

By CAPTAIN A. A. McHARDY, D.S.O., R.A.

ALTHOUGH Somaliland has long been the happy hunting ground of big game sportsmen from Aden and elsewhere, it is only within recent years that public interest has, thanks to the energy of the "Mad Mullah," been in any way drawn towards that region. To all intents and purposes a desert, the country is so full of interests, warlike and peaceful, that perhaps these notes may be of some slight interest to my brother officers.

It is not perhaps generally realised that four nations,—Great Britain, France, Italy and Abyssinia, are all represented in the 300,000 square miles of Somaliland. French Somaliland lies in the extreme N.W. of the area, on the shores of the Gulf of Tajura. British Somaliland extends along the North coast for some 400 miles and inland for a depth of from 70 to 200 miles. Italian Somaliland extends from the Gulf of Aden, southwards along the Eastern side to the Juba and Webi Shebeyli Rivers. The remaining area, the centre and South Eastern portion, is in Abyssinian charge.

The physical features of the country are strangely ordained. Going inland from the coast of British Somaliland and moving South you cross first of all some 40 miles of "Maritime plain," dotted with small sand ridges and scrub. This plain runs right round the coast. Then a sharp ascent up the Golis range of mountains with its peaks of 6,000 feet, where the track tops the range lies the Military Sanitorium of Upper Sheikh. Further South you cross some 20 miles of wilderness covered with low thorn bushes and grass in places. The thorn is similar to our old friend the "Wacht ein beitje" of South Africa, while the grass has been aptly described by a recent writer as "some of it dead, still more looking as if it were dead, with a patch of green here and there." Thence you get on to the "Haud," which is a vast stony and waterless plateau stretching from the Harrar Mountains in the West to Italian Somaliland in the East at an average altitude of some 2,000 feet. Further to the South East and about the mouths of the two big rivers, the Webi Shebeyli and Juba, the country lies low and is unhealthy.

One great obstacle which has practically controlled the conduct of not only our own but the Mullah's operations is the scarcity of water. Along the Juba and Shebeyli rivers and in the North of British Somaliland water is always to be found but elsewhere in the dry season, which lasts eight months from November till June, water can only be obtained from wells and water holes, varying from 5 to 100 miles apart, and in places 40 feet below the surface of the ground.

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When the rains break with the advent of the S.W. Monsoon in June, water lies here and there in pools known as Balis, and dry river beds become raging torrents for an hour or two. Added to scarcity, the water possesses all the properties of the Harrogate Springs in their most active form, and though no doubt a great deterrent to sunstroke, water saturated with sulphuretted hydrogen produces a thirst which in a desert is entirely out of place. Near the coast brackish water is obtained at about 6 feet below the surface of the ground. It has always been a matter of great discussion among naturalists how the animal life with which the country abounds, maintains its water supply during the long parching months.

A second source of difficulty to a civilised military commander is the nomadic nature of the Somali. There are no houses in the country except perhaps one here and there along the coast and a "Bazaar" at Berbera, and consequently no fixed capital for an invader to "go for." On the other hand, whole villages of men, women and children, move about with their flocks and herds following the grass and water. Bent rafters are carried on the camels which, with the camel mats, make excellent waterproof huts. So handy is their Karia or village of some 200 souls that 15 minutes suffice them to halt, pitch camp, and settle down to their miserable fare which is at best 2 gallons of water and 3 lbs. of dates per man per 3 days,—his "expense" ration of water a Somali carries in a small grass bottle, soaked in rice water to make it waterproof, the reserve water being carried on the camels in "heavily beaded" skins known as Huns. Following the custom of the country our troops carried their daily ration of one gallon in a canvas bag (chagal), on the person, the reserve water being carried in tins on camels, each camel carrying two tins containing 10 gallons apiece.

As a man the Somali is brave enough when worked up and very independent, but suffers from an intense dislike of manual labour, a marked characteristic of the race accounting for the absence of anything like cultivation in the country. Nevertheless he has shown up well whenever we have crossed swords, considering his arms are but long and short spears, small shields, and a few rifles of the Le Gras type, while some of the low caste tribes still use bows and arrows.

The most recent official reports point to a diminution of big game in the British Protectorate at all events; formerly (about 1891), Hartebeeste, Oryx, Gazelle and Ostriches, moved about in great herds, and it is on record that two sportsmen shot eight lions before breakfast. Elephants too were common, but these latter have cleared to the West and are gradually dwindling away. Nevertheless our columns had plenty of sport in a small way; a tiny antelope, the Dik-Dik, about the size of a hare and good to eat; the Gerenuk, a gazelle with a giraffe-like neck, and the common antelope, chiefly forming the bag. Leopards of course are hard to get, and the lions keep clear of troops, but early in 1903 a lion was found down a well at the Damot Post, and during the same year some of these animals formed a "rear party" to the Obbia column from time to time. The spotted hyena takes the place of the Indian Jackal and makes night hideous with an almost unearthly howl.

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British Somaliland shows signs of gold and other minerals, but of facilities for development there are none at the present time.

The history of Somaliland is carried back to about 3,000 B.C., when the country was known as the Land of Punt and was harried from time to time by the armies of Egypt. This continued for some hundreds of years until the country became an Egyptian Protectorate. The aborigines of Somaliland were known as the Gallas, said to be a cross bred race, partly Aryan, partly descended from Ham. The term "Gallas" still exists in Somaliland but is misapplied, inasmuch as it is now used to describe all "foreign devils."

The next landmark in this history is the spread of christianity Southwards from Egypt about the 4th Century. The Egyptian missionaries appear to have remained about the Northern coast, and ruins of their monasteries still exist.

Between 500 and 600 A.D., the Abyssinians and Gallas joined hands in an expedition to Arabia, but Mahomet's followers drove them out and appear to have crossed in large numbers to Somaliland, intermarrying with the Gallas and forming the race now known as the Somalis.

About 1,600 A.D., the Turks established themselves on the North coast about Zeila, giving way very soon to the Portuguese who likewise did not stay long, and Somaliland was gradually included in the far reaching rule of the Shereef of Mocha.

After the capture of Aden in 1839, traders pushed into the interior but the tribes were not anxious to encourage civilisation and the traders met with no encouragement.

Between 1839 and 1884, the Egyptians appear to have again visited the country, but in 1884 they perforce withdrew and British posts were established.

We now come to the rise of the Napoleon of the piece. The story runs that about 1892 there lived in the bazaar at Berbera a young Somali shopkeeper, rejoicing in the name of Mahommed Bin Abdullah Hassan,—restless in spirit, Hassan varied the monotony of life by going up country with the shooting expeditions of the "Sahibs," acquiring doubtless a knowledge of their manners and customs. Gradually Hassan blossomed into the platform orator of Berbera and became leader of the opposition, to such effect that in 1898 he considered it best to leave for the Haud and rally his most faithful adherents round him.

1899. A few successful raids on the tribes living near the coast brought more of the "faithful" to his standard, and
1900. in the following year he moved west to Jig Jiga with a considerable force. The Abyssinians now advanced against him, and Hassan, now called the "Mad Mullah," was defeated with some loss, but towards the end of the same year retaliated with two or three very successful raids on the Abyssinian border further South.

1901. In 1901, a small British column under Lieut.-Colonel Swayne operated from British Somaliland in conjunction with an Abyssinian column from the West—and the Mullah moved to the neighbourhood of Bohotole. The water difficulty made itself

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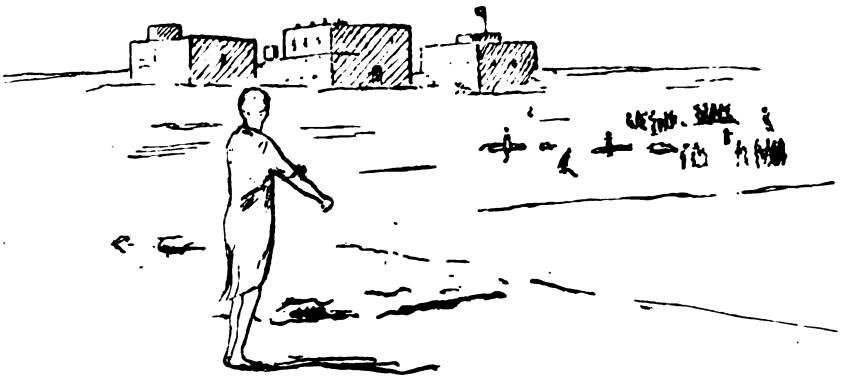
much felt and affected the movements of both sides, but in the month of May the Mullah made a desperate attack on the British Zareba now at Bohotole, only to be driven off with the loss of the bulk of his camels and stock. The advent of the rains now gave him the advantage and operations ceased.

1902. In May, 1902, the Mullah had returned to the region of Bohotole. Colonel Swayne again advanced against him but the Mullah retired South to the Galkayu Wells. It was therefore decided first to clear up the Nogal Valley where water could be had and to proceed against the Mullah later. Early in October the British column had reached Erego, some 90 miles S.E. of Bohotole, and at early dawn on the 6th October, were attacked by the Mullah in force. A desperate fight ensued. Our troops formed square but the bush was so dense that a clear view could only be obtained for some 20 yards; the Somali levies on the British left fell back at first but rallied and the Mullah was eventually beaten off with some 800 casualties. In this fight Captain Angus, R.A., was among the British killed. After this the Mullah's following appears to have melted away, according to their custom, and the British column retired behind Bohotole, which was strongly entrenched.

Brigadier General W. H. Manning now assumed command of the field force which was reorganised and transferred from the control of the Foreign Office to the War Office. A new plan of operations was decided on; the Berbera Bohotole line of communication was to be held with a flying column ready on the line. The remainder of the force to land at a point to be selected on the East coast, and (by permission of the Italian Government) operate Westwards, while the Abyssinian army co-operated along their border. A spot called Obbia was selected as the landing place, and the dis-embarkation through the reefs and heavy surf was no child's play; but under the direction of the Royal Navy the whole business was carried through with very little loss of horses and equipment, and none of personnel.



OBBIA.

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1903. Reinforcements of mounted troops arrived from South Africa and India, and in January, 1903, the forces were composed as follows:—

On Berbera Bohotole Line	2 Native Battalions. 2 7 Pr. Camel guns. 1 Company, Somali Mounted Infantry.

At Obbia.

Mounted Brigade	Major Paul Kenna, VC., D.S.O., Commanding. British M.I. (60th). Burgher M.I. Punjaubi M. I. Bikanir Camel Corps.

R.A.—No. 28 Native Mountain Battery.
R.E.—Bombay Sappers and Miners.
Infantry.—2nd Sikhs; 1st, 2nd & 3rd Bns. King's African Rifles.

February. The Mullah having been located at Galkayu, it was decided after due preparation to occupy these Wells with part of the Obbia force, and with the remainder to hold the line of communication back to Obbia till all supplies had been pushed up. then having re-embarked the Ordnance Depôt and heavy baggage, to shift the base to Berbera and roll up the Obbia line of communication towards the West. The transport question was already assuming serious proportions, the local inhabitants either could not or would not produce as many camels as anticipated, and it became necessary to temporarily convert the Mountain Battery into transport train. On the 22nd February a start was made and Galkayu occupied by the

March. Mounted Brigade without opposition on the 4th March, the Mullah having moved to Galadi. Galkayu, like Galadi and other well centres, consists merely of an open space of limestone rock about a mile square with numbers of wells and water holes, the open area surrounded by dense bush. There a halt was made for nearly a month while supplies were pushed up the line and reinforcements joined from the Bohotole side. At the end of March a start was again made, and on the 30th March the Galadi Wells were occupied by Kenna, who just touched the Mullah's rear guard inflicting some loss and capturing quantities of stock and camels.

April. A halt had again to be made for supplies, but it became imperative to act before the rainy season set in and gave the Mullah a free hand. The Mullah was reported to have retired towards Wardair, and a reconnaissance sent in that direction under Cobbe met with considerable opposition. On the 16th April, a party of his Mounted Infantry were nearly cut off, and on the 17th, the ill-fated Plunket, operating towards Gumburru with part of Cobbe's force, met the full strength of the Mullah and was overwhelmed. Mounted reinforcements were pushed up to Cobbe from Galadi that night, riding the 50 miles with 18 minutes as their longest halt, and eventually the whole force retired on Galkayu, the Abyssinians remaining on their frontier.

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Meanwhile during Cobbe's advance, the Bohotole flying column had been despatched under Major Gough on the 3rd April, and on the 22nd April was operating to the N.E. of Gumburru. At this point he encountered a large number of the enemy and after a sharp but successful action gradually fell back again on Bohotole. It was in

June. this action that Captain C. M. Bruce, R.F.A., met his death. The whole field force was now moved on to the Bohotole line, and the Mullah returned to his former haunts in the Nogal Valley.

July. In July, 1903, Major General Sir C. C. Egerton, K.C.B., D.S.O., took over command of the field force with Major H. E. Stanton, D.S.O., R.A., as his Chief Staff Officer. The army, reduced by the Boer contingent who had returned to South Africa, and strengthened by drafts of British and native troops and fresh native levies, was reorganised into a Mounted Brigade under Colonel Kenna, and two Infantry Brigades under Generals Manning and Fasken respectively.

November. At this juncture the Abyssinians moved Eastwards to Gumburru and then retired, for the Mullah was still in

December. the Nogal Valley. On the 19th December, 1903, a reconnaissance under Kenna located the Mullah with his Haroun ("Headquarters") and main body at Jidballi, some 130 miles N.E. of Bohotole, and information pointed to his moving further North. To stop this General Egerton concentrated two forces, one at El Dab East of Garrero; the other, including the mounted troops in the

1904. South of the Nogal Valley. At dawn, on the 10th Jan. the Southern force reached Jidballi and moved on in double

January. echelon against the Somalis who, reserving their fire till the British were within 800 yards advanced, strange to say, in regular skirmishing order with the regulation short rushes. Kenna was meanwhile fighting his way round the Mullah's right flank and when the Somalis, after two desperate charges broke and fled, Kenna pursued for 18 miles. The Mullah's losses must have been over 1,000; our own were 27 killed and 37 wounded including 3 Officers killed. This fight appears to have badly shaken the Mullah's prestige and with a very small party he made his way Eastwards into

May. Italian territory, and so to the South, and in May, 1904, entered into a formal agreement with the British Government and the war came to an end.

The Morning Post of the 12th February, 1907, contains the following:—

THE SOMALI MULLAH.

The Mullah, who is trading with Aden, professes friendship with Great Britain and Italy, but he has been raiding the Ogaden and Mijertain tribes.

COMMENTS.

To discuss so recent a campaign is out of place, but the following points seem to be worthy of a little thought:—

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The Mullah had of course all the advantage of transport and information on his side, and this being so, it was not till Jidballi in 1904, that he allowed his enemy to select the battle ground. On the other hand he had avoided our columns until he thought a chance had come and attacked at Bohotole in 1901, Erigo in 1902, Gumburru in 1903, at Jidballi he was attacked and broken.

In the end of April, 1903, the Mullah, whether he knew it or not, had the advantage of "interior lines," he being concentrated between Gumburru and Wardair while one British Column was between Gumburru and Galadi, the other North East of him. The Mullah first attacked and overcame Plunket's force and then (but with only part of his force), went for Gough in the North who resisted his onslaught.

It is curious to notice that at Jidballi the Mullah's men showed some signs of military training,—reserving their fire, a most unusual proceeding, while the British advanced from 1,100 to 800 yards, and when the Somalis advanced they copied our skirmishing formations, but being ill-adapted to their arms and customs the changes did not pay.

Owing to the thick nature of the bush and hence limited view, artillery was little used in any of the Somaliland campaigns. In April, 1903, Major Bridges fired two rounds with his 7 Prs. into the bush to cover the retirement of an outpost company. At Jidballi, 2 guns of the 28th Native Mountain Battery shelled the Mullah during the British Infantry advance, but on the whole there was little scope for guns.

The everlasting question of the scarcity of water affects both sides in several ways. Firstly it prevents the concentration of a force of any size for any length of time. Secondly, it ties a force to a known line of wells or water holes, with the alternative of using up the transport in carrying the water reserve. The least amount of water a soldier can manage on in that country is one gallon per diem for all purposes, a Somali half a gallon, a horse four gallons. Now every man or animal added to the force means an additional ration of water. One Somali camel carries twenty gallons only, therefore additional rations soon mean more camels, which in their turn mean more personnel and so on till you get an enormous train of camels carrying hot sulphurous water alone. To obviate this, the mounted troops as a rule rode from well to well sometimes 40 miles, but even with this saving a large water train was a most necessary evil. The horses of one mounted unit which missed the track in 1903, were 48 hours without water and suffered no casualties.

The value of sea power in enabling a force to shift their base and hence to choose the locality of operations and direction of advance, is well shown in the change of base from Berbera to Obbia in January, 1903, and back to Bèrbera in June of the same year.

The troops engaged, in the later phases of the war at any rate, were as various as it is possible to imagine. In 1903, the force consisted of British, Boer, Sikhs and Mahommedans from the Punjaub, Rajputs from the Scinde Desert, Yaos from Central Africa, and Somalis. To legislate for the peculiarities of each race was no mean

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A King's African Rifle ("Yao.")

task in a desert where nothing grows but thorns and sand. The Yaos, of whom the King's African Rifles are chiefly composed, possess the soldier qualities in a marked manner; physique, courage and energy are all present, and given a blanket and a little rice, they will fulfil a volume of "Operation orders." Melton Prior, in one of his war sketches, has well and truly depicted the landing at Obbia, where the men of so many races worked side by side, and as the memory of that scene comes back again now and then it makes one reflect in an idle sort of way on the great fighting strength we must have behind us as an empire, were that strength ever to be fully mobilised.

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SOME REMARKS UPON THE EARLY HISTORY & DATES OF FORMATION OF THE COMPANIES OF ROYAL ARTILLERY—1705-1757.

By MAJOR JOHN H. LESLIE, R.A. (*Retired List*).

THE following sources of information bearing directly upon this subject are available, and furnish *facts* regarding the history of the Royal Artillery during this period.

1. The original Company Muster Rolls and Pay-Lists, at the Public Record Office, Chancery Lane, London.

2. The MSS. scheduled in Series "A" of the "Dickson Memoirs," published at the R.A. Institution, Woolwich.

3. "Notes on the early history of the Royal Regiment of Artillery," by Colonel S. Cleaveland, R.A., published at the R.A. Institution, Woolwich. This book is generally referred to as the "Cleaveland Notes."

4. "List of Officers of the Royal Regiment of Artillery" from the year 1716—commonly called "Kane's List,"—published by the R.A. Institution, Woolwich.

5. The "Digest of Services" of each unit of the Royal Artillery.

I do not think that these "Digests" should be accepted as good evidence unless supported *independently* in the clearest possible manner.

The fact of a statement being contained in this book is in itself no sufficient guarantee for its accuracy, although an Officer once ingenuously observed in regard to the claim of a battery to certain War Services, that the claim had "always received official sanction, and "the facts are duly noted in the official 'Digest of Services' which "is periodically examined at Army Head Quarters."

In the List of "Changes in the Royal Artillery," originally compiled by Major Murdoch, R.A., and revised and corrected in July 1903 by Lieut. R. C. W. Williams, to 9 units only (see Table A.) of Royal Artillery, is assigned a date of formation *prior to the year 1757*.

TABLE A.

Royal Field Artillery.

Designation. Jan. 1907.	Date of Formation.	Original designation.
1st Battery.	1705	Train of Artillery.
2nd "	1705	Train of Artillery.
5th "	1743	Captain James Deal's company.
12th "	1749	Captain Alexander Leith's company.

Royal Garrison Artillery.

1 Mountain Bty	1705	Train of Artillery.
2 Company ...	1705	Train of Artillery.
3 Company ...	1705	Train of Artillery.
4 Company ...	1718	Captain Thomas Pattison's company.
5 Company ...	1743	Captain Borgard Michelson's company.

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In this List of "Changes" there are shown, in addition to the 9 units given in Table A., 8 units (see Table B.) as formed *in August 1757*—the month in which the 23 Companies were first organised as two separate battalions—and these 8 units are assigned either to the 1st or 2nd battalions.

These 8 must have been actually formed prior to the establishment of the 2 battalions, because when the latter were formed—August 1757—*no new Companies were raised.*

TABLE B.

Designation of unit in 1907.	According to List of "Changes" was formed in August 1757, as:—	
	Company.	Battalion.
6th Battery, R.F.A.	7	2
7th Battery, R.F.A.	9	31
No. 7 Company, R.G.A.	3	2
No. 37 do do	8	2
No. 50 do do	6	2
No. 62 do do	2	2
No. 84 do do	1	2
No. 100 do do	5	2

These 8 units can therefore claim a date of formation prior to August 1757, and such claim can be easily verified and proved by reference to the original Company muster rolls.

But, it is misleading to say, as in the List of "Changes," that the "original designation" of a company was No - - of the - - battalion, for it was not until after the year 1820 that the *numbering* of companies was introduced.

The original style was "Captain . . . 's company, of the . . . "battalion," and companies took precedence in accordance with the seniority of their Captains. No doubt considerations of space in compiling a large tabular statement have to be taken into account, but surely that is no good reason for giving incorrect titles to units without explanation.

Table C shows the various years between 1716 and 1757 in which the 23 Companies were formed—see page 201 of "Kane's" List—from which the two battalions came into existence in August 1757. The Cadet Company is not included.

TABLE C.

Year.	Month.	No. of Companies formed.	Total	Captain's names on formation.	Page in Cleaveland Notes.	Page in Dickson Memoirs	Remarks.
1716	May	2	2	Richards. Pattison.	189, 192		
1718		2	4	Hughes.	198	22	Establishment given as 4 Co's.
1740	April	1	5	Melledge.	223		
1741	April	1	6	Williamson.	226		
1742	March	2	8	Leslie. Sumpter.	227		
1744	March	2	10	A Cunningham. Mace.	229		
1747	.....	3	13	.....	232	31	1744 at foot of p. 232 "Cleaveland Notes" is obviously a misprint
1748	.....	...	10	.....	236	35	3 Companies reduced, leaving 10
					237	36	
1755	March	4	14	Farquharson, James. Cleaveland. Hislop.	244	38	Date of List on p. 38 Dickson, should be 1755.[2]
1755	Oct.	2	16	Hind. Farrington.	245		
1756	April	2	18	J. Brome. A. Tovey.	246		
1756	May	1	19	Phillips.	246	.....	Miners. Became Artillery in 1757.
1757	April	4	23	Dovers. Martin. Innes. Smith.	257		

[1] This is incorrect. The 3rd battalion was not formed until 1759. It is probably a misprint for 2.
[2] S. Glegg, the junior Fire-worker on this list was not appointed such until April 24, 1755. Northall, Captain-Lieutenant on this list, was promoted Captain on October 1, 1755. The date, therefore, of the List must be between April 24 and October 1, 1755.

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Of the 23 Companies given in Table C., 9 are accounted for in Table A., and 8 in Table B. What has become of the other 6? They are not shown in the List of "Changes" as represented by units of to-day, nor do they appear under the heading of "Reduced Units."

The question is an interesting one and requires careful investigation.

It appears to me that if the dates of formation of these 23 units, and the circumstances connected therewith, were examined, much light would be thrown upon the period of our Regimental History between the years 1705 and 1760.

To invite discussion on some of these points, I put forward the following statements regarding the dates of formation of 4 of the Companies mentioned in Table A.

2nd Battery, Royal Field Artillery.

This Battery *was not formed until May, 1756*, and the mistake in the date of its formation is undeniable.

It was "*raised*" as a Company of *Miners* in 1756, and converted into a Company of *Artillery* in 1757.

The Royal Warrant directing this Company to be "raised" is still in existence and, as evidence, cannot be impeached. It is endorsed:—

"Warrant for raising a Company of Miners and adding the "same with a Major to the Royal Regiment of Artillery."

It is as follows:—

"George R.

"Whereas it is requisite and necessary for Our Service that a "Company of Miners shall be raised without loss of time and in-"corporated into our Royal Regiment of Artillery, We do therefore "authorise and require you to cause a Company of Miners to be "forthwith raised and incorporated into our said Royal Regiment of "Artillery accordingly."

* * * * * * * * *

"Given at our Court at Kensington this Twenty first day of May "1756, in the Twenty ninth year of Our Reign"

"By His Majesty's Command,"

(signed) H. Fox.

But, this warrant notwithstanding, it has pleased the authorities to antedate the formation of the Battery by fifty-one years, and to say that it is to be considered as having been formed from the old train of artillery of 1705, although, in fact, it was *the 22nd Company in consecutive order of formation.*

That is what one may call the official manufacture of history.

I am quite aware that the opinion here expressed may not be taken kindly by the battery in question, but as I had the honour of serving in it myself for nearly six years, I feel less compunction than I otherwise should in pricking the bubble of its 1705 formation. A battery which has existed for more than 150 years and which fought at Minden, at Talavera, in the Crimea, and in South Africa, can well afford to dispense with the spurious antedate of 51 years. The authorities made a mistake and never had courage to own it.

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5th Battery, Royal Field Artillery.

This is shown as having been formed in 1743 as Captain Deal's Company; but Deal's Company was in existence much earlier than 1743. Deal was a Captain of April 1, 1725, and commanded a Company at Gibraltar from 1727 to 1742, as is proved by the Muster Rolls. In 1743 he does not appear as in command of a Company, *nor were any Companies raised in 1743.*

41 Company, Royal Garrison Artillery.

This Company—shown as formed in 1718, as Captain Thomas Pattison's Company—was really formed in 1716[1]—one of the first two formed. A pay-list of this Company for February 1717 is in existence.

46 Company, Royal Garrison Artillery.

This is shown as having been formed in 1705 as one of the train of Artillery Companies; reduced in 1722; and reformed in 1744. I can find no evidence to show that *any Companies were reduced in 1722.*

[1] Royal Warrant for the establishment of two Companies of Artillery dated May 26, 1716. See Duncan's "History of the Royal Regiment of Artillery"—3rd edition, 1879—Vol. 1., page 432.

A criticism on Captain Noott's suggested alteration in graduating Directors & Goniometric Sights.

BY MAJOR P. DE S. BURNEY, R.G.A.

SPEAKING from a Heavy Artillery point of view, it would be fatal to mark the Directors and Goniometric sights as suggested by Captain Noott in the "R.A. Journal" of December, 1906. The normal method of coming into action employed by Heavy Artillery when firing from concealed or covered positions is by using an Aiming Point. This has been determined on after careful trials and is found simpler owing to the necessity, with long range guns, of extreme accuracy in using aiming posts and the consequent loss in time. The B.C. lays at zero on the Aiming Point with his Director, and then switches on to any target he may be given, this angle (if he is fairly near his guns) he gives to the guns with R or L according as the target is R or L of the Aiming Point. Now if the Director and sight were graduated as Captain Noott suggests we would have a result as follows.

The B.C. at D having clamped director at zero on A.P. switches on to target and reads angle 330°. Now if this angle is put on sight at G and then E is brought to E′ to be on A.P. the gun A.B. moves round to A′B′ which is 60° off the "line of fire." Captain Noott says in his para 3 "leaves the difficulty of R and L very much where it was." But is there any difficulty? When the intention is for the guns to lay on the Director, then the Director is put up with zero towards the target, then the angles are given to the guns and

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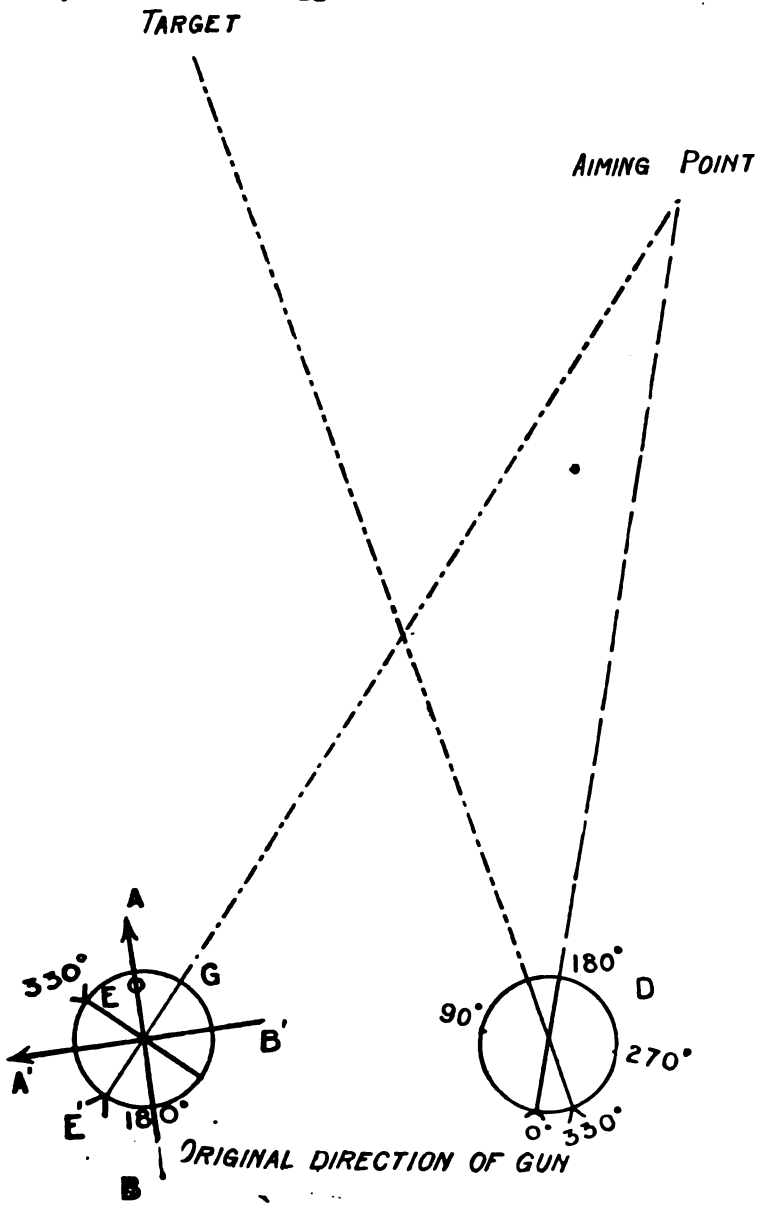
R or L according as the particular gun is R or L of the line *Director—Target* that is looking at the target; nothing can be simpler than this. When using an Aiming Point the Director is clamped at zero on the Aiming Point and the angle (or corrected angle) to the target given to the guns and R or L according as the variable factor (viz. the target) is R or L of the Aiming Point. These two rules appear to me to be far easier to remember than those that would ensue by the alteration suggested.



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The Capabilities of Mules as Transport Animals.

By F. J. DAWSON, Esq., M.I.C.E.

HAVING recently done what I believe to be almost a record in travelling with mules, some notes on the journey and on the capabilities of mules as transport animals, gleaned from my own experience may possibly be of interest to your readers.

On December 22nd last, I left Pietersburg (Northern Transvaal) at about 11 a.m. with a wagonette, eight mules and luggage; in all—probably about 3,200 lbs. behind the animals, and I reached my camping ground, on Magalo's Mountain, 82 miles North of Pietersburg about 5 p.m. on the 23rd, the journey, I need hardly say was done by very easy stages.

During the 24th and 25th the mules were grazing and doing no work, but on the evening of the 25th I found that it was necessary for me to, if possible, catch the train back to Pretoria from Pietersburg, leaving Pietersburg at 8 p.m. on the 26th. I instructed the native driver to select the best six out of the eight mules, alter his harness, &c., and be prepared to start at 5 a.m. on the 26th. Under all ordinary conditions and unless there is very heavy pulling to be done, I prefer a team of six to a team of eight, as the smaller team is more under the control of the driver and each individual member does his more even and proportional share of work than is the case with a long team, of which the leaders are probably just out of range of the driver's whip. At that time I believed I should be able to arrange for a relay to meet me or that I would somehow secure fresh mules and I had no intention of taking the one team through the whole journey, as I ultimately did. It will therefore be recognised that the animals were in no way specially prepared to undertake an exceptional journey, they were undoubtedly in good travelling condition, well and regularly fed, seldom stabled but groomed and handled whenever possible, and they had had two days rest on the mountain, grazing all day and tied up at night with a feed of mixed dried oathay and mealies in their mangers.

A start was actually made from the camp at 5.30 a.m., and the load behind the mules consisted of:— Wagonette, four wheels, each 4′ 2″ diameter, 5′ 6″ guage and 5′ 9″ axle to axle, weight empty 1,500 lbs. Load consisting of 2 native drivers, two passengers, baggage, &c., or say in all 1,100 lbs., or 2,600 lbs. behind the team. The team was composed of all Argentine mules about 13 hands, all aged, but all used to working together, and the stages in which the journey was taken were:—

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1st Stage:—

5.30 a.m. to 7.30 a.m. 13 miles travelled; in 1st mile a rise of 200 feet over rough mountain track, then a fall of 1,000 feet to 5th mile, of this distance two miles was fairly formed mountain road and the other two miles, nothing but a rough track. From 5th to 13th mile the road was fairly hard and level.

Rest or outspan of 20 minutes.

2nd Stage:—

7.50 a.m. to 10.10 a.m. 17 miles over fairly level road with a gradual rise. At this point, Bandolier Kop, 30 miles from the starting point, I hoped to get telegraphic communication with Pietersburg and so arrange for fresh mules to come out along the road to meet me but being bank holiday, the wire was closed at 10 a.m. and I missed communication by 10 minutes.

I outspanned here for 40 minutes and left on the

3rd Stage:—

10.50 a.m. to 12.20 p.m. 12 miles, good road slightly down hill. Here the animals were watered and given about 4 lbs. of forage (oat-hay) a piece, the outspan lasting 1 hour and 20 minutes.

4th Stage:—

1.40 p.m. to 4.10 p.m. 22 miles over good and fairly level road slightly rising.

Here, in spite of telegraphic communication having failed, I hoped to find a spare team at a road party camp, but was disappointed, and as my team looked quite fit in spite of the 64 miles they had done, I decided to go on as I was so near my destination.

The outspan lasted 40 minutes.

5th Stage:—

4.50 p.m. to 7.30 p.m. 18 miles, first half mile very heavy black turf, or mud into which the wheels sank about 3 inches, and after that an even gradual rise of about 500 feet with a good road surface, the last two miles being down hill.

The animals did not appear in the least distressed or blown by a journey of 82 miles which they had accomplished at the through rate (including rests) of 5.86 miles an hour or excluding rests or outspans at 7.45 miles an hour.

The total journey time was, 14 hours and the total actual travelling time 11 hours, outspans occupying three hours.

Early on the 28th December, I enquired how the mules were and received a reply just 40 hours after the completion of the journey, that the mules were quite fit and ready to trek again.

I think the foregoing experience shows what mules, when properly treated and cared for can do, when called upon. These animals as I have before stated, were in no way specially prepared or trained

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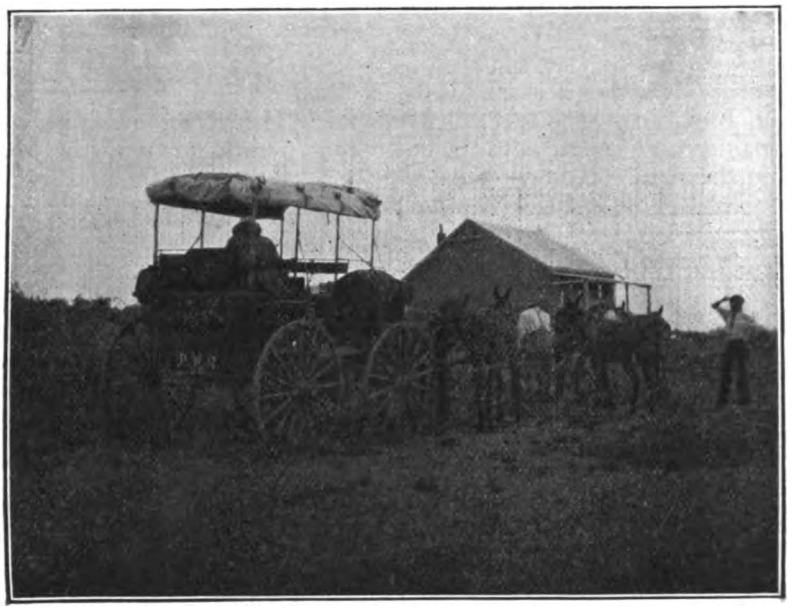

to undertake an exceptional journey, and yet they did two days' work in one and felt none the worse for it. The native driver was an exceptionally good boy, he never worried or pushed the team unnecessarily, and seldom used his whip, but the whole secret of the successful accomplishment of the journey lies, in my opinion, in the fact that the mules were given comparatively short spells in harness, varying from 1½ to 2½ hours, mostly a little over two hours.

Mules, if they start well fed can go a long time without feeding, but an outspan, lasting only 10 or 15 minutes, but giving them time to stretch themselves, have a roll, &c., freshens them up wonderfully, and they start again as new beasts. The distance a mule travels while in harness; so long as he is not forced above his pace; is more or less immaterial, but the *time* is essential. Mules particularly mares, seldom stale in harness and a roll is as essential and as refreshing to them as a shower bath to a man.

The day on which this journey was undertaken happened to be a cool one. Threatening rain with light drizzle at times, no wind and an average temperature of about 70° (this is a guess as no thermometer reading was taken). Grazing was good throughout and water plentiful, (owing to recent heavy rains).

I attach a photo of the team, which also shows the vehicle used, taken as they were being harnessed up for their 5th stage having then done 64 miles.

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Barr & Stroud Rangefinder, F.Q. Type, "Infantry," 31½ inches (80 cm.) Base, for use with Infantry, Cavalry and Machine Guns.

The approximate uncertainty of observation with this rangefinder, at a range of

600	yards is	2	yards.
1,000	,,	6	,,
2,000	,,	24	,,

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Experiences of the past, and their application to the present.

By COLONEL LONSDALE HALE.

A Lecture delivered at the Royal Artillery Institution, Woolwich, on Thursday 14th February, 1907.

COLONEL F. B. LECKY, D.S.O., R.H.A., IN THE CHAIR.

THE CHAIRMAN: Ladies and gentlemen, Colonel Lonsdale Hale is so very well known that he needs no introduction from me, and I will ask him if he will kindly commence.

COLONEL LONSDALE HALE: Colonel Lecky, ladies and gentlemen, I purpose to talk to you this evening about military history, and to put before you certain views which are held with regard to military history, the need of knowing military history, the object of knowing military history, and the purposes to which we can put that knowledge.

On this subject of military history, there is a distinct difference in the views held between the older officers and the younger officers, and it is with the latter that I find myself the more in accord; and I believe that ere long we shall have sounder views with regard to the treatment of military history; and I purpose also to try to show you this evening, that it is not a subject for only arm-chair students, or Hamleys, or Chesneys, but it is one for even the most junior officer for his most ordinary work in the field.

This subject with its high sounding title "Military History" is clothed generally in gorgeous raiment, and I intend first of all to examine those clothes by taking each garment, as it were, and ascertaining of what it is really composed, seeing whether it is not perhaps homespun really, and whether on the outside of it there has not come in the course of time a certain amount, let us say, of gold lace and embroidery, which present it before us as an awe-inspiring subject. I think we shall find that on the outside of these garments there is a good deal of shoddy, and that the extreme grandeur of the subject is somewhat of an imposture.

Now the clothes to which I am referring, gentlemen, are words; words are the clothes in which this subject is wrapped up, and, therefore, I shall have to spend some little time in talking about words and their meanings.

A word, when it is originally coined, connotes, means, that is to say, some very simple subject; but in the course of years, perhaps, that subject grows, it acquires certain fresh attributes and so on, and yet the old word is retained, and therefore, by degrees the word which originally meant something very simple has lost its original

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meaning, and is supposed to mean something utterly different. Sometimes people who deal with these subjects find that a thing originally simple has become so complicated that they cannot find any words in English to express it; then they are driven to the use of foreign languages and the use of dead languages, the classics,—Greek is a great source of these new names, and we find that gives to those words an importance even in the most ordinary things of of every day life. There is a charming little book called "The Book-hunter," by a man named Burton, in which he gives rather an interesting illustration of this, and to him I am indebted for the idea that in a domestic difference between wife, cook and husband, as to the cooking of oyster sauce, for cod, the party who speaks of oysters as "Monomyarian Malacology," would simply by the employment of this clothing for "oyster," score greatly over the two others.

But it is not merely that words get so pompous, but with all words there are certain associations connected, and we cannot get rid of those associations. Somebody said "What's in a name? A rose by any other name will smell as sweet." So it will, but there are certain associations with a rose, and if we call it by some other name those associations seem almost to disappear. Let me take the word rose. Substitute for it, even by general and universal consent, the word "turnip"; and then see how will fare the touching love scenes in novels in which the rose is so often conspicuous; or even in poetry, in the lines which refer to the "wearing a wreath of roses the night when first we met." Do not think me frivolous; what I want you to see is the importance of names and their meanings, and I will come a little more closely now to our subject and scrutinise a few of the words.

First of all there is that awful word "Science." There is the science of war; there are scientific Societies; there is that very detestable person the scientific soldier; there is the scientific man; and around us in my Corps, and also round the gunners, clung in the old days those horrible words the Scientific Corps. But what does science mean? It means simply knowing—nothing more than that; "a knowledge of" or "knowing." Therefore, when we talk of the science of war as a desirable thing we merely mean knowing war—that is all. I long to take from Library shelves that label "Science of War," and put up the old meaning "knowledge of war."

And then with that is that cognate word "art," "art of war." Now "art" is not so bad, because while it has gone up, it has gone down also, and "art" may mean anything. We have the art of sculpture, we have the art of painting, and we have the fine arts; but then we do not look upon that word "art" with so much terror because we have the art of cooking omelets, and I know there is an art,—though I do not practise it myself,—of picking pockets. Therefore, while the word goes up it goes down. But what is the art of war? If you look into any dictionary you find "art" originally means "fitting and putting together," and that art means doing something with the means at your disposal. Therefore, when we come to the art and science of war it merely means knowing war and as practical soldiers doing war.

Now we come to another word which is somewhat alarming, and

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that is " history." Of course the associations of our early days with history meant merely acquiring the names of Sovereigns and the dates when they lived, and the dates when they died; and when you come to history in after-life you find that history is somewhat of a severe subject, and if you want to know how severe it can be, take the history of the dark ages, or, as soldiers, take any history of the Thirty Years War, and if that does not appal you I don't know what will. Then there are other histories which are much more readable, like Milman or Gibbon, or Buckle or Graatz' History of the Jews, and lastly, by no means least, your name sake, Sir, Lecky's History of Rationalism, and so forth. But although they are very readable, history undoubtedly does require a great amount of concentration of attention; you cannot read the most readable history without feeling that you have to keep your attention going.

But nevertheless what is history? It is merely the record of incidents and events of the past. Let us forget history in any other connection than that it is merely the record of events and incidents that have occurred in the past.

Now we come to that terible word " study"—the study of military history. Study does not frighten gunners or sappers because we have all been brought up from our earliest years to study. The real meaning of study is reading, understanding and thinking over; and we should have been neither good gunners nor good sappers if we had not begun it early. But with the rest of the Army it is different—it conveys certain terrors, and I am quite sure that if an absolutely new subject was started, and you were to take by lot three sappers, three gunners and three of the rest of the army, all of equal intellectual power, and then test them, at the end, when they had acquired it, you would find that the people it had caused least trouble to acquire would have been the sappers; it would have given a little more trouble to the gunners, but to the rest of the army men it would have been a real trouble and toil. And for the simple reason that study is no trouble if you keep it up. Every sapper every day on going into his office probably has to look at a plan, and look at an estimate, to think over, to understand and to read about it; and similarly the gunner, but perhaps to a less extent. But very many of the officers of the rest of the army drop with their education, for a time at all events, the habit of reading, the habit of thinking, the habit of understanding; and that is why study for the ordinary officer of the army is so hard. Therefore, to the younger officers who are here I would recommend this most strongly: Do not in any way give up the habit of occasionally reading, understanding and thinking. It is easily dropped, is that habit, and it is extremely difficult to regain.

Now then, to sum up—the study of the science and art of war is merely knowing war, and doing war; and the study of military history is merely reading, understanding and thinking over some of the events and incidents of the past.

Now I have not come here, gentlemen, to talk to the young officers only; I have come to talk to all of you, irrespective of ranks, and I hold that it is the bounden duty of all ranks from Generals down to Subalterns to study from time to time military history and to do so

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voluntarily. And I desire to emphasize that in this Lecture I am dealing with the study of military history as a voluntary study only. What I may say has no reference to the courses of study on the subject at Military Educational Establishments or elsewhere. If officers will not study military history voluntarily, they are not safe men to entrust with the lives of others. You cannot be good soldiers in the field if you have not adopted this study to a certain extent. And why not? War is not a brand-new creation of to-day. War has been going on ever since the world was created. The principles of war are the same to-day as they were thousands of years ago. The incidents of to-day have occurred in war over and over again before; whether they are the most important or the most trivial incidents they will recur again to-morrow; and if you do not choose to acquire a knowledge of what has happened in the past, then when they come before you in the future you will not know how to meet them.

Let us take for instance what would be really a superhuman being. Let us suppose that we are under a man who has a superhuman knowledge of everything that has happened in war during the last hundred years, whether it is so-called strategy or tactics or any of the minor details of war. That man would be the safest man possible to be under. When he gets into a tight corner he will simply recall all the same tight corners in past years; he will know who did not get out of them by acting wrongly, and who got out of them by acting rightly. That would be the safest leader to be under. But then I hear "Oh, yes, we are very happy to study war," and I may be told by my younger friends "I go up for any amount of Army examinations, I have attended all these Army exercises in the field, and I think that is quite enough." Gentlemen, that is an utter mistake. Let us take the Medical profession. Supposing a Surgeon or a Physician was content simply with reading up for his examinations in order to acquire his diploma; supposing he is content with seeing certain cases treated in hospital, or he is content with seeing certain operations performed and then he is launched in his profession to look after people's bodies, and after a time he is called in to see a case he never heard of before,—and in consequence of his ignorance the man or woman dies,—if he had known about it he might have cured the patient. But that case had been already recorded before; he would have found it in the records of the past of his profession. The mere training for a profession, the mere practise of a profession, cannot possibly give you examples of everything that may happen in it, and if you are going to content yourselves simply with examinations or exercises you will go into the field uncommonly badly equipped for war.

I have often thought what would have been my own case if I had gone out, say, to the Boer War as a full Colonel and had been given charge of a column. I am perfectly certain what would have happened. I think during two days of military fine weather I should have trundled that column-wheel-barrow to perfection, but I am very much afraid from what I know of my own self that if there had been a military storm on the third day I should have upset that column-wheel-barrow altogether, and the Boers would have picked up the contents. But on the other hand if I had been in certain situations where regrettable in-

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cidents occurred, I am perfectly certain that if I had had any influence those regrettable incidents would not have occurred, because I should have recalled to my mind the things which happened before. It is dangerous to venture on this subject, but I will take one case, and that is a column (I do not know who commanded it) which encamped at night on a plateau with one very steep side, and up that the Boers came and rushed the picket, and rushed the column. Whoever commanded that column could never have been at Gibraltar. I was there in my young days when Sir Charles Warren was a subaltern in my company and either just before or just after I got there he scaled the big rock. But it was not one individual—there are records at Gibraltar of parties scaling the big rock; therefore, in those days we set to work in order to still further scarp it. This officer in command of that column cannot have remembered Gibraltar. I will take another case. I do not know whether there are any Cornish men present, or anybody who has been to Bude. If you have been to Bude, before 24 hours are gone your lodging-house keeper stops you and says "Have you been to Stratton Hill?" I pleaded my ignorance "I have not been here" "What, you do not know the battle of Stratton Hill," "No" I said "I do not;" she said "You go there. That is where the Royalists and Parliamentary people fought and the Royalists thoroughly beat the Parliamentary people." I bought a 3d. guide-book and went out to Stratton Hill, and there was identically the same case. There were the Parliamentarians, looking out on the easier side of the big hill. During the night, or in the early morning, the Roylist force crept up at the back of it, steep, covered with wood. I merely give that as an evidence of the same thing.

What I have said so far applies to all ranks, but now I have to say a few words as to how the incidents differ, and in what direction each rank should go with regard to this study. We are a great deal too apt to forget the differences of ranks and the difference of positions in war; we preach to them all alike on the study of military history, and do not tell them in what different ways to study it. There are certain people who are everlastingly thrusting down our throats Napoleon or Wellington or Cæsar; these three men studied war so much that you, young Lieutenant Smith, must go and do the same as they did. Well, gentlemen, I hope you will not think me rude when I say I do not think there are many of you who ever will be Napoleons or Wellingtons or Julius Cæsars, but what is the good of putting Wellington and Napoleon before average British officers as an example? They were superhuman. If you want to know what they could do will you take their despatches, and taking any day you like, gather together all the different letters and despatches they wrote, dictated or drafted in one day. Then and not till then will you realise the gigantic intellects of those two men, and their superiority over the common herd to which I belong. They really were superhuman, and it is no good holding them up as examples. The fact is there is too great a tendency at the present day to try and induce officers to aim at too high a standard, and some of us think that it would be well if at first an officer was encouraged to prepare himself simply for the station in which he finds himself. I have had the advantage of discussing

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this subject with an extremely clever gunner, and also with a General Officer of infantry, and they both say that the great tendency of the present day is to hold up too high an aim for officers. But, on the other hand, do not think I would discourage aiming high, and I will read to you some remarks from a most admirable Lecture to which I had the pleasure of listening the other day on the Study of Modern History, by Lord Esher, which was really almost a cover for a Lecture on the Study of Military History. He is speaking there about the calling into existence a General Staff who are to study war, and take care of us all, and he makes these remarks, which I would ask you to take home and think over. He is saying how desirable it is that you should have a General Staff in the Army for certain problems "But the British officer," he says "as I have before remarked, from the most senior to the most junior, is liable to be placed in positions of responsibility owing to the exigencies of our Imperial rule, wholly different from, and far greater than, those which any German is ordinarily asked to occupy. The situations in which a German officer is likely to find himself in war, are imaginable" (an admirable word to describe what Lord Esher meant) "and limited. On the other hand, so varied are the duties of a British officer and so world-wide is the sphere in which he moves habitually, that the power of dealing with unforeseen situations is for him almost a necessary attribute. To train a body of men, endowed with special aptitudes, and selected for that reason, in the highly technical duties of the Staff, and to give them special preparation for the part which a General Staff must play in modern war is not only desirable but vitally necessary to success in the field against highly trained foreign troops. But it would be a bad day for England, if this necessary condition of modern war were to induce the great body of British officers to suppose,"—listen to these next words gentlemen, they are Lord Esher's words not mine,—"to induce the great body of English officers to suppose that outside the circle of the General Staff, education and reflective habits of mind counted for nothing, or were considered superfluous. History is full of examples of the tremendous responsibilities and fateful decisions which have been necessarily undertaken by British officers of all ranks in all parts of the world. Few stories are better known than that of the illuminating telegram sent in May, 1857, to the Commander-in-Chief in India, by two of the young men whose clear sightedness and decisive action saved the Punjab, and helped to save India. It was typical of the discerning knowledge of native history and native character which so many of the younger officers possessed at that time, and which contributed so much to the successful quelling of the Mutiny." Gentlemen, far better than any Lecture I could give are those wise words of Lord Esher, calling upon all ranks to reflect, to read, and to think on war.

And now with regard to the different ranks. First of all with regard to Generals and seniors, of course their studies rather apply to what is called strategy, that is the leading of large bodies of troops; and it is probable that the senior men with experience and judgement would do that better than the men of younger years. But the principles of strategy are always the same, and they are applic-

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able to all matters connected with war; and all—the youngest subaltern, must know something about strategy. In fact they do know it—and they know it without knowing that they know it; they know the principles and are constantly using the principles, utilising them. And I have got three so-called principles of strategy, which I will illustrate to you to show my meaning. The first is a matter about which the literature of the present day is simply voluminous. Well, consider me to be rather a strong man, and I know there is a man less strong than I am coming through that North door, and another man less strong than I am coming through the East door; if those two fellows set upon me together I shall be done for. I know that it is the man who comes in at the North door that will be nearest me, and all the assistance I have is a small boy. Well now, try to realise what I should do. I should say to the small boy, " Look here, get every chair you can, and every bench, and stick them against that door,—the East door.—Here is a little barbed wire "—to come up to modern times—" stick that round the chairs. On that desk you will find a basket of rotten eggs, and when this fellow comes and is trying to get round the wire and the chairs pelt him with the rotten eggs, not with stones, because he could throw them back at you and perhaps hurt you." But while he is holding him at one door I meet my other friend at the other door and give him a licking. Then I come back, and aided by the boy tackle the second fellow here. That is a well known problem of strategy—" Interior Lines."

Now let me take another case. I have a wall at my back, there is my valued umbrella, my constant companion, in that corner at the Western end of the wall; I would not part with it for all the world, though nobody would take it from me, it is so old. My dinner is on the other side of the Eastern door. Sombody is coming in from the Northern door, and his dinner is out behind it, and I am coming along the wall from the Eastern door to recover my umbrella. That man coming down from the North catches me with my back to the wall. If I give him a licking he will not lose his dinner—he has his back to it. If I am engaged at this wall and get licked how about my dinner there? " Forming Front to a Flank." That is all that that is.

And now I will take, if I may venture to do so, the officer who has honoured me by taking the chair. He and I are at logger heads He has got hob-nailed boots on. He is a powerful man and I am a weak, old man. He comes against me and he is powerful with his fists—I do not like those fists. He is a good hand at kicking with his hob-nailed boots—I do not like those hob-nailed boots—how on earth am I to deal with this all-powerful enemy? I somehow manage to hit him the most violent blow I can in the pit of the stomach; I knock his wind out of him, and floor him altogether so that he cannot use his legs or his hands. You know what that is called, " Strategical Penetration." But how simple! I recommend you to follow it. That is merely showing you how all these general ideas of strategy are wrapped up in tremendous words.

The incidents of war it is desirable we should know may be divided into three sets. First of all there is the higher leading off the

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battlefield, which usually falls to the senior. Next there is the higher leading on the battlefield, or the leading which falls to seniors and juniors; and then there are, thirdly, the minor incidents. Now what is the object, that is the next thing, what is the object of your learning all about war? I say it is purely utilitarian—absolutely for no other purpose. It is not merely to get a certain knowledge of what has taken place in the past, but it is for useful purposes. You may be called out to-morrow to fight, and then the information that you want is best suited if it is suited for to-morrow—if it is simply utilitarian for to-morrow. Very well then, if it is that, what part of war are you going to begin with in your studies? Are you going to begin with the wars of Cæsar, and read down to the present time? Do you not think that the war of tomorrow will be more like the war of yesterday than like the war of the day before yesterday, and more like the war of the day before yesterday than the war of the day before that? The true way of reading military history is to read it backwards; and on that I am very glad to say I find Lord Esher is of the same opinion. Speaking of ordinary modern history, he says "I should like to say at this point that I have always believed, contrary to the usual scholastic plan"—(that is a delightful way of putting it—is that "the usual scholastic plan") "in the great advantage of reading history backwards, of beginning, say, with the 19th century and working back to the age of the Cæsars. We should by this means get rid of a quantity of irrelevant matter." "To read these books without discriminating between what is merely historically interesting and what is illustrative of possible work ahead of us. would be long and tedious. Much that you might read can be passed over lightly." That is the principle of studying all military history and Lord Esher with his great knowledge tells you it is the way of studying all military history. Work backwards with the remembrance that you read in past times a great deal of irrelevant matter. The principles are always the same, but the application of them differs so much in modern wars that it is a waste of time to see how they were applied in old times when the whole of the conditions were entirely different. I should recommend anyone first of all to try and take up Manchuria, and then go back to 1877 and 1878, then the second, as well as the first phase of 1870, then, say 1866, and by the time you have got to the War of Secession in America, which is full of strategy (do not think you young officers that Stonewall Jackson's campaign in the Shenandoah Valley, that hackneyed campaign, means all the history of the War of Secession—it is one of the hugest businesses going, and you will find in it every possible strategical operation)—I think when you have done that, you will have had about enough of it. But remember that your studies must always be utilitarian, and if they are to be utilitarian for you as British officers, you must consider the means which are at the disposal of this nation. The study of some campaigns is of no good to you at all, because we could not under present conditions take part in them, and while you read your military history you must also at the same time consider the effect of sea power, by studying what Mahan says upon the subject. Now when you do sit down to read I strongly recommend you to follow the example

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set by Napoleon, which Lord Esher gives us here. How did Napoleon set to work when he was studying? "The first point" says Lord Esher "which any soldier desirous of studying modern history should bear in mind, is that a few written pages of analysis or reflection upon one chapter of a book are worth more than reading volumes in what I have called the ordinary way. Perhaps the best example of the most profitable method of reading history can be gathered from 'Napoleon's Précis of the Wars of Turenne and Frederick the Great.' He was in the habit of marking paragraphs and sometimes whole chapters in a volume, after which he would comment on them most carefully, illustrating his comments by references to past examples, which he had obviously carefully looked up, or to future possibilities upon which he had evidently long reflected." That is one of the points which with my long teaching experience I endorse, and would emphasise most thoroughly. For goodness sake when you take up anything in military history do go into it thoroughly; do not go trying to get a sort of encyclopædic knowledge of various campaigns—in every campaign there occur so many incidents which occur in others, that I will back a man who has mastered one campaign thoroughly, and I put great stress upon that word "thoroughly," to know more and be a more practical soldier than the man who has merely passed a general examination in half a dozen. Do concentrate, and you will find the work will be quite hard enough for you.

Now we come to the second division, and that is big battles. And here I own I feel not very hopeful. How are you to prepare yourselves for the big battles of the future? I hold that unless a man has had practical experience of the repeating rifle and smokeless powder in the field he cannot understand what a battle is. I have talked at the Staff College and elsewhere to many experienced officers on this matter and they perfectly agree with me in confirming my idea that you cannot at an ordinary field day simulate an actual battle under modern conditions. We could in those days of smoky powder. I could see everything and understand it, though I have never seen a shot fired in anger. But it is personal and practical experience only which will show officers who have not been under fire already what that sort of battle under modern conditions is like. Well then, is it very much good for you to employ all your time, or much of your time on the details (I am only talking of details; I shall have to make that qualification directly) even of the battles of my old love the Franco-German War? There is hardly a battle in that campaign that I could not tell you the details of. What is the value of those battles to-day? As regards details but little indeed. What good is there of going into the details of tactics of battles of the old days? What good is it to you gunners? What good is it to you to know how the artillery were fought in those battles? It cannot be done today. Therefore, while as I propose to point out directly it is of great value to look at battles, still it is sheer waste of time to go back to the battles of antiquity and waste your time by finding out in what formation Davout brought up a column of infantry there, or Murat brought up cavalry there—it is waste of time with regard to preparation for your immediate future. Do it later if you like, but

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you have to get ready for to-morrow and the future.

And now how should these old battles be studied; they should be studied for the principles on which they were fought.

There is hardly any battle that does not afford instructive instances of good battle-leading and of bad battle-leading, but it is the leading of the higher kind, the general plan and the general course of the battle in connection with that leading. Thus at the battle of Laigny-Pouprey 2nd December, 1870, we find a Corps and two separate infantry divisions, and on the outer flank a cavalry division. The whole force is on the defensive awaiting attack. The cavalry well out to the front report an advance of the French. The Commander of the force determines to take the offensive, and to concentrate to the front. But the Corps on his right is attacked in flank on the march; it takes up the best position it can find and holds out almost to its last gasp agains heavy odds. The centre column, advancing to the appointed place of concentration, sends the Corps a little help in artillery, then moving secures the point of concentration, and then the Commander on his own initiative goes with his main body to the help of his comrade and with him gains a victory. The Commander of the left column, chooses to take a wrong initiative altogether, and goes away without permission, in the opposite direction for a fight with another enemy on his own account. Nearly the whole of one volume of Hoenig's Volkskrieg is devoted to the detailed account of this battle. Most interesting it is and valuable is the teaching as to the higher leading and the play of human nature in the various ranks. But I own that I think that a very few pages would suffice to contain all of its lessons suited to prepare us for tomorrow. I know a small book giving in some 45 pages the "Story of Waterloo." It is brief accounts of battles, similar in form to the narrative in this small book that will give us all the information required for the utilitarian study of war now-a-days, for battles of the future.

And here I may interpolate the question, what future? What is to be the future battlefield? Do you believe in aerial warfare? I do. Do you believe in aerial observation? A man of much knowledge said to me the other day " I think with regard to fortresses we shall be able to do something, to drop something frightful into a fortress or into trenches, and very likely we shall be able to move our aerial machines, so that if there is a mass, say a brigade or a division in mass together we may be able to interfere very much with it." Another man, when I brought these views before him said " Oh no, that is not within practical politics." But a third, a man who knows a great deal said " In two or three years we shall have flying machines, and we shall possibly even have warfare in the air, and you in your profession will have to look out not merely to fight your enemies who are on the surface of the earth, but to fight your enemies who are above the surface of the earth." Personally I am inclined to believe in the last opinion, but anyhow, I ask you in all your thoughts of warfare for to-morrow to remember that present conditions are purely tentative, and that they may alter altogether and radically in future.

But with regard to these battles of the present time, nobody knows how a battle will be fought on a grand scale. You merely

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have to go to Lectures given by different people from time to time on the plan of attack to realise that. An officer who had seen a good deal of work in Manchuria said to me, that the frontage is so great that notwithstanding the increase of means of intercommunication it will be absolutely impossible for one Commander to regulate the whole course of a battle. It seems probable, therefore, that a battle in modern days will resolve itself into a number of battles along the whole frontage, each practically independent of the others. Then you see you will have to take part in those. Those small battles will not be under divisional Generals, but probably they will be under Colonels, and then men of that rank will have the problem before them how they are going to conduct them. There is no solution at present. We shall find a solution no doubt hereafter, but it is the gunners who have a very great difficulty before them with the great increase of range, and also the difficulties of intercommunication. It is all very well to talk about wireless telegraphy. In Sussex Sir John French communicated with his cavalry brigade, many miles off, by wireless telegraphy; but sometimes, as we all know, telegraphy and communication will be temporarily broken. I was informed on credible authority that at the Sussex manœuvres for one hour did the gunners fire into a village which had been taken by their own troops. That is very possible. You with your long range are told to fire at an object a long way off. How can you tell what has taken place there? You cannot by sight, and it was an hour before they could communicate with the gunners to inform them that the village was captured from the enemy that fire went on. I can believe anything with regard to gunners in that way, on account of your long ranges. That is a difficulty, if I may humbly say so, Sir, as a non-gunner, and an extreme difficulty in working your artillery either in masses or detached on the modern battlefield with its large frontage of attack.

Now, gentlemen, I come, you will be glad to hear, to the last branch of my subject, about the minor incidents of war—and this is what I want the younger officers to get hold of, I do recommend them whenever they can get hold of them, to find out and learn what I may call the minor incidents of war—what takes place on a picket; what takes place in the attack or defence of a village—those things which may fall to their lot. And it is not such hard work to do so, because the sources from which you can get that information are comparatively so easy. I have always found that the most difficult source is the officer who knew most about it. I find that the man who has seen a great deal of war and done well is more difficult an oyster to open than anyone else; he will not tell you; but you can manage to draw him and get something out of him. Then you will find these lighter incidents to which I refer not in the abstruse heavy strategic histories of war, but in the diaries of the people who took part in the war, or in the lighter literature. Of course those of you who read German will find plenty of sources of information, because some of those regimental histories are simply magnificent. The Germans, some of them, when they write their regimental history will tell you how badly the regiment behaved as well as how well the regiment behaved; their histories are not of the type of British

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regimental histories, which are many about as bad as could possibly be put together,—chiefly a list of officers, and when the Prince Consort or the Prince of Wales came to visit the regiment, and the type of dinner that was given. That is a good English regimental history. But the Germans tell you—they are not ashamed to tell you which part of the regiment went wrong. There is a book "Wie Wir unser Eisern kreuz erwarben," that is full of incidents.—at the same time I am sorry to say that not many officers do read German, but those of you young officers who do, for goodness sake keep it up; you will find in German military literature a mine of practical information and of practical value which you will find neither in French nor any other literature.

There is an incident connected with Le Bourget which might occur to you if you happened to be in a village. On the right hand side going out of Paris there used to be a quadrangular building with a great court inside. The Germans when they came to attack that building entered from the North and kept up a fire through the windows of the floors against the French on the other side. Then it occurred to some smart German, " This is all very well, but how about the attics," and they made their way up to the roof which was not inhabited at all, and then they found that there were no partitions in the roof and the Germans quietly stole the whole length round the square through the roof, which nobody was even thinking about, and fired down through the floor on to the French below. Those are the things that regimental officers ought to know, and which they would find of the greatest possible benefit whenever they are teaching their non-commissioned officers and men. When an officer is lecturing to his men upon the fourteen or more points a sentry has to bear in mind, or the points the picket commander has to bear in mind; with every one of them he should give a concrete instance to help them to understand it and remember it.

But with all these stories you must remember that you must take them *cum grano salis*, and a very large grain of salt sometimes. It is not that men who write or say what they have seen wish to exaggerate, but as a matter of fact that human faculty of observation which is so extremely weak for accuracy under ordinary circumstances becomes dreadfully weak in the stress and excitement of war, and the men do not know exactly what occurred even in their own immediate vicinity. There was one regrettable incident in the South African War, I will not mention exactly what it was, at all events there was an enquiry. Company officers came and gave evidence. Listening to it there was a Staff Officer who had been present the whole time, and who from a comparatively secure post of observation had noted down what each company did, and he told me he was never more astonished in his life than he was to hear the statements put forward; it seemed so difficult for a man under hot fire to portray facts as they appeared to an observer at a distance I have never been under fire myself, but I am told by those who have been that the mental faculties of a man are so excited by what goes on under fire that his report of what happened is most untrustworthy. That is one great source of error—that is with regard to inaccuracy of record. You had better find out carefully whether you can check it from other sources.

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And now a caution in the use of incidents. Whatever you do when you get hold of these incidents, do not go building up theories on some one incident, even if it is true. I have known in old days men build up their theories of something with regard to cavalry or artillery and bring forward one small incident for its foundation. And there was no incident more freely used after the war of 1870, than Von Bredow charge of six squadrons, so-called, against Canrobert's VI. Corps. The cavalry men held it up against the artillery men. They said "we rode through your batteries, and rode through your lines of infantry and managed to get out again." For years I sought information about this charge. I have been there all over the scene, and my old friend, a German General, Von Wright said " I always take my young officers out there to see the undulations of the ground, and to show how they help cavalry to approach without being seen." That was a very fair idea on his part. Still I was not quite sure; and it is now some years ago that I met an officer who is now in England, and who rode with one of the Cuirassier squadrons, in that charge, and he was severely wounded. Now I will give you in his own words what he said. Remember I am talking about Cavalry *versus* Artillery. He said " I was severely wounded and I was taken down to the hospital at Nancy, and there in the same hospital was," I understood him to say " the officer who commanded that battery which had been ridden through;" at all events he was an officer of the artillery that was ridden through by the Cuirassiers; and, continued my friend, " I said to the French officer, what an extraordinary thing it was—here we had come in the open day over a mile at a gallop towards you; you were firing; you never saw us; and you never brought one single gun to bear on us." "Oh," said the French officer, "nonsense, not see you, of course I saw you, I saw you coming along, but you remember that at that time we gunners were engaged in a very heavy artillery duel with the German guns at Vionville. The orders against change of target in the French Army were of the most stringent description, and before I could get leave to bring my guns to bear upon you, you were clean upon the top of us." Well now, it has taken me years and years to get that explanation, and if that explanation is right it may have shown a want of initiative on the part of the French officers, but I do not see that the incident itself can be adduced by cavalry against artillery as an instance showing that you can successfully attack gunners.

Now, gentlemen, I have at length come to the end of my discourse, and have to thank you for the patience and courtesy you have shown in listening to me for so long.

THE CHAIRMAN: Does any gentleman wish to make any remarks on this very instructive Lecture?

COLONEL LONSDALE HALE: I hope not, Sir.

THE CHAIRMAN: Then I will propose a very hearty Vote of Thanks to Colonel Lonsdale Hale for his most useful, practical, and instructive Lecture. (Applause).

COLONEL LONSDALE HALE: Thank you.

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A CORRECTOR

Improvised and used by the 24th Native Mountain Battery, (Frontier Force) at the 1907 practice.

By Lieut. G. W. V. HOLDICH, R.G.A.

THIS was devised and perfected (more or less) during the hot weather of 1906 at Nowshera, when business (military business) was slack and the Mohmands had ceased from troubling, and the Swatis were at rest.

Beyond the usual routine work—which is by no means small even in the hot weather in a native mountain battery—there was little else to do save grumble at the thermometer and watch it creeping up till one wondered if it would ever stop its upward course. The long long Indian day passes somehow and for once was productive. Captain J. H. Keogh then temporarily commanding the battery set himself to devise a corrector. Beyond that he knew there was such a thing he had nothing to go upon and the actual machine itself was shrouded in nebulous mystery. The initial start was, therefore, the hardest part. A careful study of the local range table calculated for a height of 1,500 feet above sea level gave the needed clue. It was noticed that the range table roughly divides itself into three portions, viz. (1). Below 2,000 yards where 15 minutes increase or decrease of elevation gives a difference of 100 yards. (2). Between 2,000 and 3,800 yards where 20 minutes is equivalent to 100 yards, and (3). Above 3,800 when 30 minutes increased elevation is required to increase the range 100 yards.

Taking then three strips of water-proof paper—of the pattern used by draughtsmen for tracings—these were divided similarly by equi-distant lines. On each division of strip A. (see diagram) were placed the hundreds of yards commencing from 1,000 up to 6,000—it was thought unnecessary to go below 1,000 yards. Between each of the hundreds of yards, the fifties were entered. On the B strip were placed the elevations in degrees and minutes from 1° 30′ to 21° corresponding to the hundreds of yards. Up to 2,000 yards 15 minutes were placed opposite each 100 yards, above 2,000 yards and up to 3,800 yards (i.e. from 4° to 10°) 20 minutes marked in tens of minutes corresponded to each 100 yards and above 3,800 yards 30 minutes marked so that each 15 minutes was equivalent to 100 yards. Strip C was now taken and on each line corresponding to 100 yards on the A. strip was entered the fuze length for that range calculated as above mentioned for a height of 1,500 feet above sea level,—the

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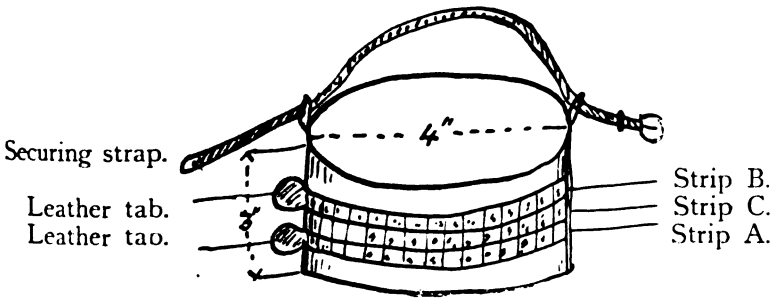
average level of our practice grounds. The fuze length (T. & P. No. 60 Mk. II.), it will be noticed sometimes works out in round numbers and sometimes in halves, but each 100 yards has its own fuze length opposite it. On either side of the fuze scale were marked in red ink the figures 1 to 51 commencing with 1 opposite 1,000 yards, fuze 5, and ending with 51 opposite 6,000 yards, fuze 44,—these were our corrector readings. The difficulty now was to settle the normal reading, and as the maximum elevation and depression of the gun (10 pr. B.L.) on level ground are 25° and 15° respectively, a proportion of 5 to 3, it was decided to adopt three fifths of 51 or 30 as the normal. Under corrector reading 30, therefore, was drawn a red line with arrow heads and on strips A. and B. corresponding to corrector 30 or fuze 24½ were drawn arrow heads as indicators. It would perhaps have been as convenient to have adopted corrector 29 as the normal as it is here that the elevation corresponding to 100 yards increase of range changes from 20 minutes to 30 minutes.

By the system of marking and manufacture adopted the following maximum angles of sight of elevation and depression can be allowed for when laying by clinometer:—

		Elevation.	Depression.
at 1,000	yards =	+ 9° 0′	−0°
„ 2,000	„ =	+ 11° 30′	−2° 30′
„ 3,000	„ =	+ 13°	−6° 0′
„ 4,000	„	+ 10°	−7° 45′
„ 5,000	„	+ 5°	−9°
„ 6,000	„	+ 0°	−10° 30′

As, however, Mountain Artillery usually fire direct, it was hoped that the notation adopted would suffice. The three strips A, B, C, were now mounted on a leather cylinder of about 4 inches interior diameter, and 3 inches height, so constructed that the fuze setting number could slip it on his left arm, where it would be out of the way while he was doing his work as a gun number in limbering up and unlimbering, and yet be readily available when he commenced fuze-setting. This position and pattern for the corrector were settled on as it was impracticable to attach it to the gun carriage or ammunition boxes, or to any more convenient portion of a man's body than his arm.



To revert to the description. The centre strip, C. was placed in the centre of the outer surface of the cylinder and sewn fast or glued to it. Strips A. and B. were then placed on and made movable

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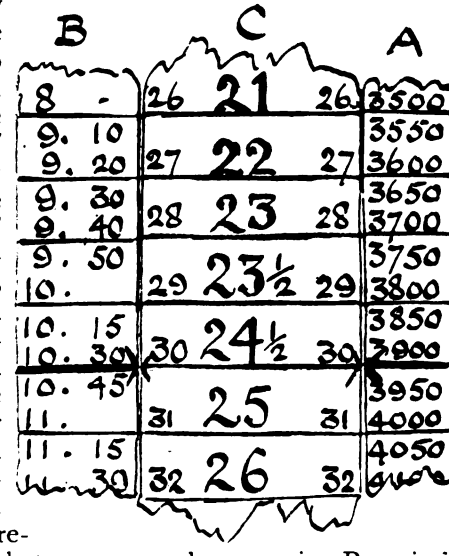
around the circumference being fitted with small leather tabs to operate them—they were placed one on each side of strip C.

Now to explain the working. When firing by quadrant elevation, the Battery Commander, having first obtained the angle of sight and having approximated the range from his rangetakers, looks opposite this range on his corrector—by the way each Section Commander and each fuzesetting number besides the Battery Commander were supplied with correctors—and let us say it is 3,200 yards corresponding to 8° of elevation and that the angle of sight is 1° 20′ depression. This is deducted from 8° leaving 6° 40′. The Battery Commander runs the 6° 40′ line down to the 3,200 line, looks to see where the arrow head of the B. strip has got to and finds it opposite 34 which is the corrector setting. Looking again opposite 3,200 he decides what elevations to give his ranging section. He gives these out and also Remainder—Corrector 34 decrease 1. As soon as Time Shrapnel is ordered, the fuzesetting numbers having already set their correctors look opposite the elevation ordered, read off their fuze, set it and load. e.g. B.C. orders (right section, being ranging section) 6° 40′ Time Shrapnel. No. 3 gun (corrector 34) load with fuze 19; No. 4 gun (corrector 33) with fuze 18; No. 5 gun (corrector 32) with fuze 17½ and No. 6 gun (corrector 31) with fuze 16½.

Another example and a diagram may serve better to explain the working:—

Diagram. Scale 3:2.



Showing normal. Arrow Indicator and point of change from 20′ to 100 yards series to 30′ to 100 yards series; e.g. range takers give your range as 3,950. Angle of sight 30′ depression. Elevation for 3,950 is 10° 45′ Add angle of sight 30′—Total 11° 15′ which is nearly opposite corrector 32. Fuze 26 or 4,050 as you like. Move 10° 45′ down until it comes opposite corrector 32. Fuze 26 or 4,050 as you like; then red arrow will be opposite 31. Give Remainder corrector 31, decrease 1. Still keeping arrow there, look opposite 3,950 for your range and you will find 10° 15′. Whereupon having got a bracket say between 10 and 10.30, give Remainder 10° 15′ Time Shrapnel. If you are on right of battery. No. 3 gun (corrector 31) will then load with fuze 25, No. 4 with 24½, No. 5 with 23½ No. 6 with 23. The advantage of course is that you can range with Time Shrapnel and pull down your range without thinking of your fuze which latter will be (automatically) done for you by the fuzesetters.

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Another method of obtaining the corrector setting is to multiply the angle of sight in degrees by 4, 3, or 2, according as to whether the range is below 2,000 yards, between 2,000 and 3,800 yards or above 3,800 yards. The result is added to or deducted from the normal corrector setting according as to whether the angle of sight is one of depression or elevation. The figures 4, 3, and 2, are due to the fact that below 2,000 yards each division of 100 yards equals 15 minutes, above 2,000 and up to 3,800 each 100 yards is equivalent to 20 minutes, but above 3,800 it requires 30 minutes to equal an increase of 100 yards. In using this method, which would only be done probably if the B.C. had no corrector handy, it must be reccollected that a slight complication may arise when the degree scale + or — the angle of sight changes from the 20 minute series to the 30 minute series, and vice versa. For example—supposing the elevation to be 9° 40′ equal to range 3,700 with an angle of sight depression 2°. This being in the 20 minute series we multiply by 3 and the result is 6. Now opposite 9° 40′ is corrector reading 28, so we have only one division of 20 minutes, and if we run the arrow down six divisions to 36 we shall have an excess of $5 \times (30-20)$ minutes $= 50$ minutes. We must, therefore, put the arrow back $50/30 = 1\frac{2}{3}$ divisions, and our proper corrector will be $36 - 1\frac{2}{3} = 34\frac{1}{3}$ or say 35.

The value of the corrector was proved at the very first day's practice. A badly laid round gave a wrong bracket for a target on a knife edge. The Subaltern running the series gave—Remainder Corrector 31 decrease 1, of which echelon corrector 28 gave the only burst in air. He went to section fire with this corrector but found his shell bursting a long way over. He thereupon shortened his elevation 20 minutes and that being insufficient he again came down 20 minutes. At each fresh order the fuzesetting number looked opposite the new elevation and set the fuze corresponding to it without further order. The results were most successful. Another battery firing at the same target failed, on account of some nullahs, to locate it at all though they had two attempts. On the following day at a target on one of three ridges the other battery again failed. On this battery firing, the Subaltern running the series picked up one shot, got a ladder of fuzes and a burst in air on this one shot and finally by decreasing his elevation eventually got the right range and fuze. Observation, owing to nullahs in front and rear of the target, was very difficult.

All these results were obtained with native gunners, and, as during the whole practice there was no fault found with the fuzesetting, despite our having ten different "lots" of fuzes; it may be well claimed that the corrector was a success. Anyway, a corrector of some sort is very necessary and until government supplies us with one the one described will do us well. It is perhaps a trifle "kutcha" but with a little ingenuity will undoubtedly be made more accurate regarding the markings, and more substantial.

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THREE WEEKS IN MANCHURIA.

By CAPTAIN T. M. ARCHDALE, D.S.O., R.H.A.

DURING the summer of 1905, I had the opportunity of visiting the Manchurian battle-field while on leave from India. I think that perhaps the following notes on some photographs which I took, may be of interest to my brother officers.

Shousanpu:—

Shousanpu Hill commands a splendid view of the scene of the fighting South of Liaoyang. The distance from the railway to the apex of the Russian position, a hollow road running over a col on the East end of Rocky Ridge was about three miles, and from there the line bent sharply North East to a hill North of the village of Hsin-li--tun which was within range of the redoubts round Liaoyang. The right rested on two small villages close to the railway and on a small eminence between the latter and Shousanpu. The villages had been strongly fortified and semi-permanent works constructed, and the Japanese in spite of fierce efforts failed to capture them. A gun position between the peaks of Middle Hill flanked the whole face of Rocky Ridge and another behind Low Spur firing South West assisted the defence in that quarter. Good cover had been provided behind the hills for supports and reserves and communication roads cut where the slope was too steep. Along the front of the position the Russians had placed wire entanglements and rows of military pits, while at the apex of the position there was a row of stone fougasses. The eleven Russian redoubts outside Liaoyang, stretching in a semi-circle from river to river bank were very strongly built; thick parapets about six feet command with plenty of overhead cover under parapet and parados. Wire entanglements filled the ditches which were about eight feet deep and fifteen feet broad Wire entanglements also, combined with rows of trous-de-loup six feet deep with a pointed stake at the bottom encircled the redoubts.

Shahosu.—Linshenpu:—

The Japanese trenches lay on the left bank of the Shaho among the kilns of a large brickfield, from the railway as far West as the bend of the river opposite Linshenpu. These trenches must have been well over six feet deep when new, as even in their present state

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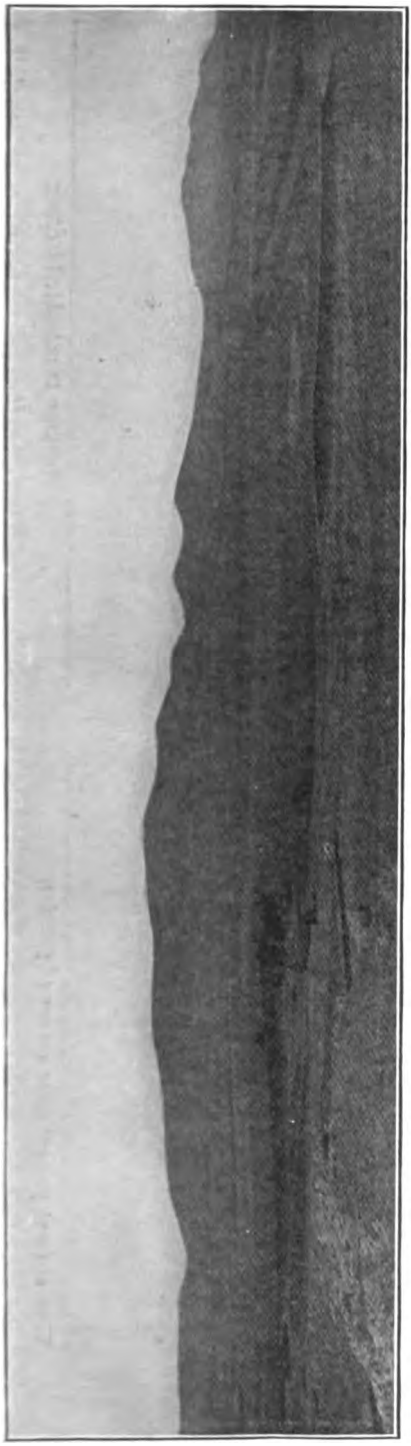
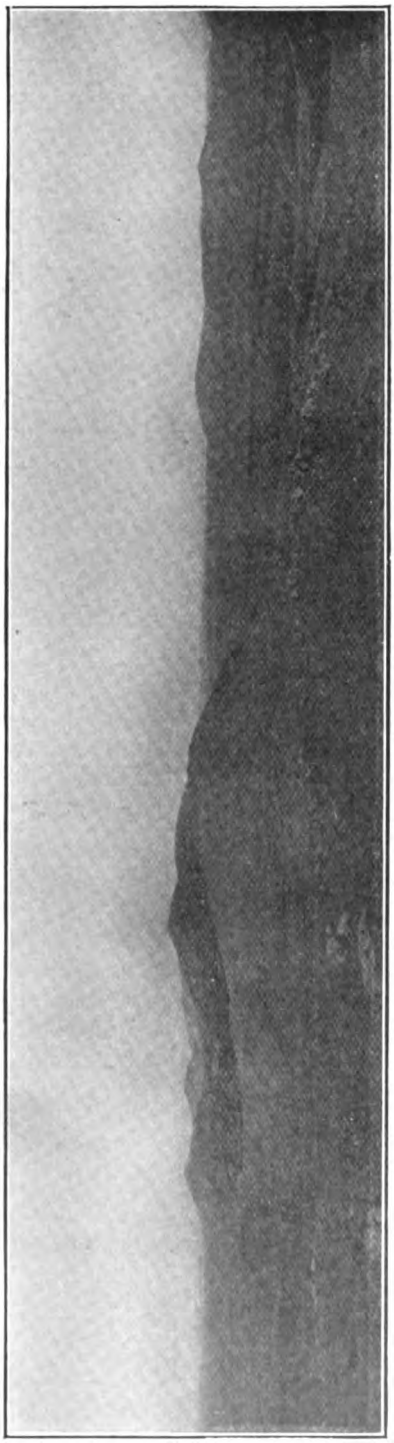


View of Shousanpu position from Hsin-li-tun village (left rear).



Shousanpu position from east of Rocky Ridge, facing apex of position.

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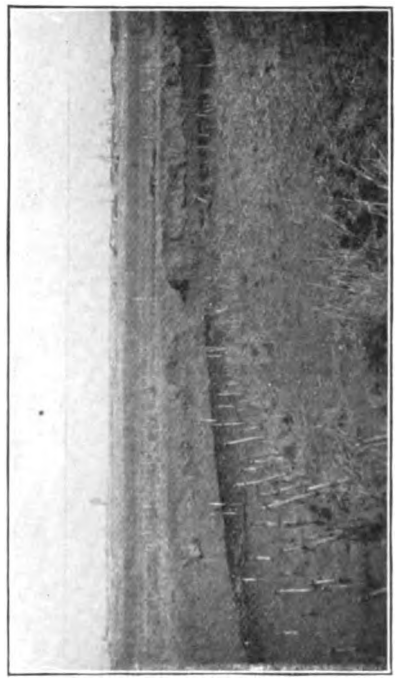
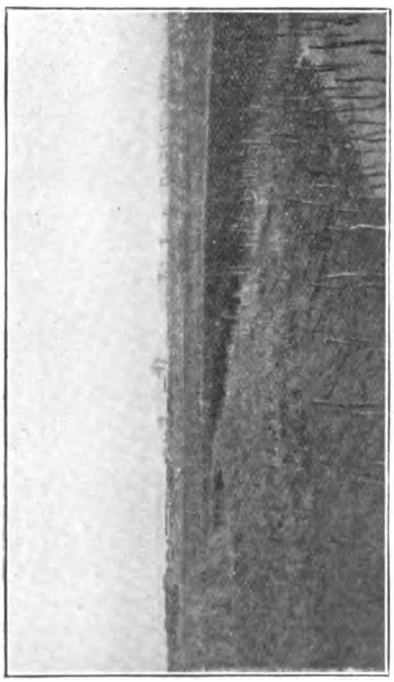
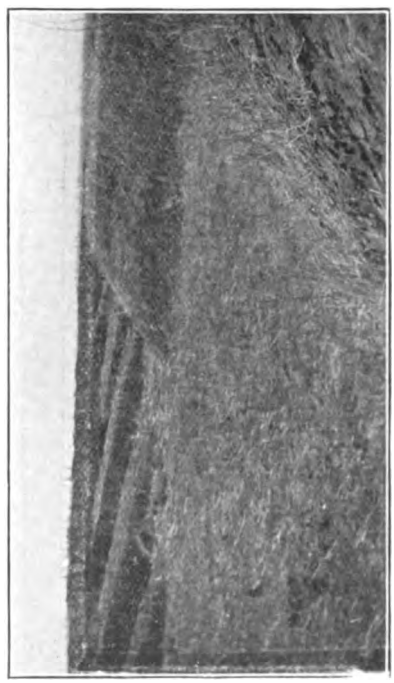
Cover under Parados.



Entrance to redoubt, Liaoyang.



Entanglements in ditch.



View of front parapet from corner of parados.

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I could not see out of them. They extended in every direction, provided for every possible contingency, and must have given their occupants complete protection with at the same time a clear field of fire. The Russian trenches ran close to the edge of the cliff and seemed to have been well constructed with shelters close behind, but the latter had been so filled in that it was impossible to judge of their extent. A gun emplacement, probably for a battery, was visible about 400 yards in rear on a slight rise, but most of the guns were placed still further back. The rival trenches were not more than 100 to 300 yards from each other. In Linshenpu there was an example of the effect of field gun shell on mud walls, clean holes through but no other damage.

Pensihu.—Taling Pass:—

The Japanese have constructed a light railway 2′ 6″ guage from Mukden through the mountains to Corea, practically following the line along which Kuroki's army advanced. It crosses the Taling Pass which had been entrenched by the Japanese. The summit of the hill at Pensihu between the Pensihu and Taitze valleys had been entrenched for Infantry and Artillery, and a well graded road made for the latter from the Pensihu side. The gun-pits were cut out of the rear crest. On the hills to the East the trenches ran along the crest of a sharp spur descending from the mountains to the Taitze river. On the other side of the Taitze the line was continued along a flat spur where the trenches were just below the crest line and had an excellent field of fire across a broad valley running North and South. These trenches were used against a Russian flank attack which nearly got in.

Taschichiao:—

The position at Taschichiao had Mount Shishisan, a high and steep shale mountain, as its centre, lined with Infantry trenches, and on a low hill to the right were gun-pits with more Infantry trenches. The guns were placed on the rear crest so must have been very inconspicuous from the enemy's position while having a good field of view and fire except immediately under the hill in front. Taschichiao was a strategic point of great importance as it covered the railway to Newchang, a good naval base.

Lung-mean-wo.—Foochow Valley:—

Lung-mean-wo is a long spur jutting out into the Foochow valley from the East, about 1,500 yards North of and facing a gap in the hills through which runs the road, the railway, and a tributary of the Foochow. The gap is about a quarter of a mile wide and bounded by high hills which overlooked the Russian position. The Russians guns on Lung-mean- wo were well placed but the field of fire was practically limited to the gap in front, only the left of the line, bending forward, commanded the Western bend of the Foochow for a short distance. However, they prevented the Japanese infantry from debauching through the gap into the valley for the first day. The Japanese first placed some guns in the open but had to leave them

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under the heavy fire of the Russians; at nightfall they moved them behind a rise on the East side of the valley and the Russians never correctly located the new position.

Rinchiatun:—

West of the hill Rinchiatun the Japanese guns were placed on a bluff overlooking the river and facing Tafangshin and the main Russian position West of the Foochow. Here they were of great assistance to their Infantry, who, after crossing the river, had to advance across an open strip of cultivation.

Tafangshin.—Telissu:—

Tafangshin and the high ground behind it were held by the Russians as an advanced post, their main position being about one and a half miles further back towards Telissu. Their guns were placed on the centre spur of a set of three, a good position, as it must have been hard to tell which spur they were on. All critics appear to agree that the Russian position as a whole was bad, both flanks being exposed and the line of retreat lying up a defile, also no precautions had been taken to secure safety in case of defeat. The result of the battle fully justifies these criticisms; the hills commanding one side of the defile being occupied by the Japanese with disastrous results to the retreating Russians.

Nanshan:—

This position is well illustrated by the left hand laid on the table with the fingers slightly bent and a little apart. On the spurs represented by the thumb and fingers were redoubts with trenches along the front and sides underneath them protecting the valleys in between. Trenches ran down on each flank to the seashore. The field of fire was excellent, and though there was a certain amount of cover in the broken ground at the foot of the hills, all movements of the Japanese must have been clearly visible for two or three miles. Two field batteries on a hill in rear guarded the right flank, but did not effectually guard the left which was also exposed to the fire of the Japanese gunboats. These gunboats firing on the reverse slopes of the hills played an important part in the defeat of the Russians.

Port Arthur:—

I first paid a visit to the War Museum erected by the Japanese which contains a marvellous collection of specimens of all kinds of war material used in the Siege by both sides. There were cupboards full of uniforms, forage, and foodstuffs in bottles and tins, while weapons, shell, cartridges, electric appliances, tools, &c., &c., were laid out on long tables neatly labled in Japanese. An improvised "crows-foot" of thin iron rods joined in a cube or square with their pointed ends projecting at all the corners was very neat, also the small hand-grenades made out of any article available, tin canisters, 7lb. shell, &c., of a size convenient for throwing and containing high explosive. A small grenade made of cloth and about the size and shape of a sausage, filled with a slow burning composition was used to throw against sandbags to set them on fire and so cause the earth to fall

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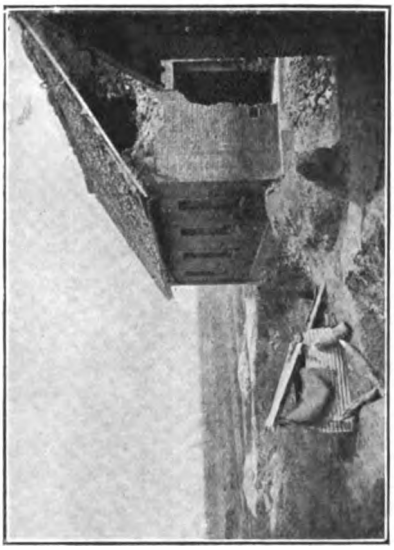
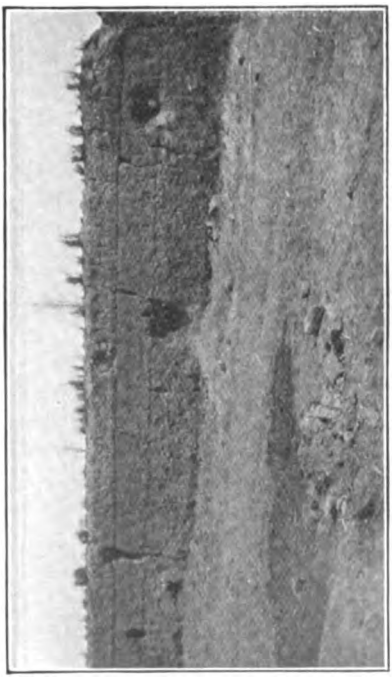
Jap trench in brickfield between Lamutun Village and railway. Walking stick left to shew depth of trench.



Pumping Station at Shahosu.

Jap trench and loop-holed wall between railway and Linshenpu.



Wall in Linshenpu village.—Shell holes.

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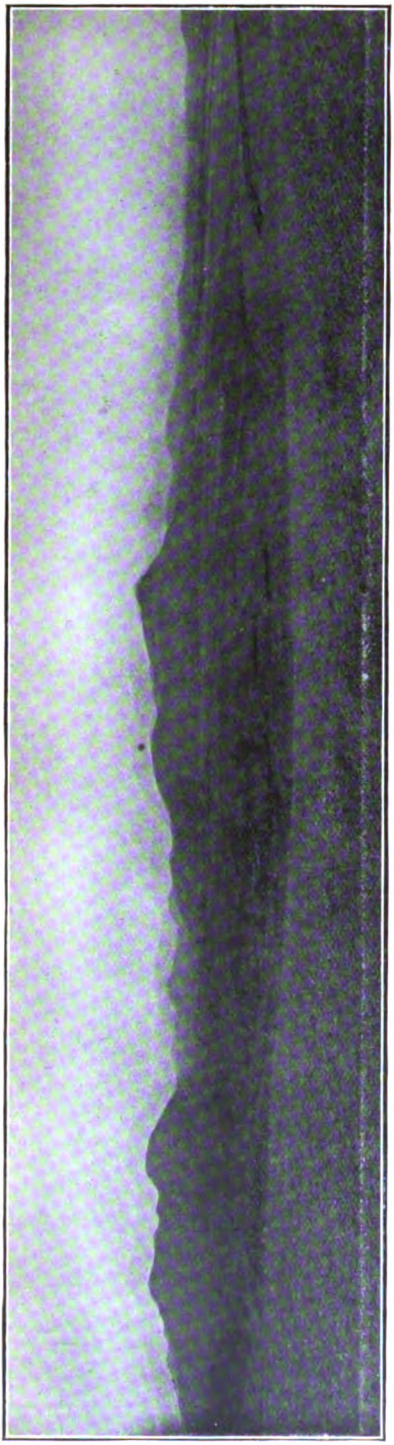
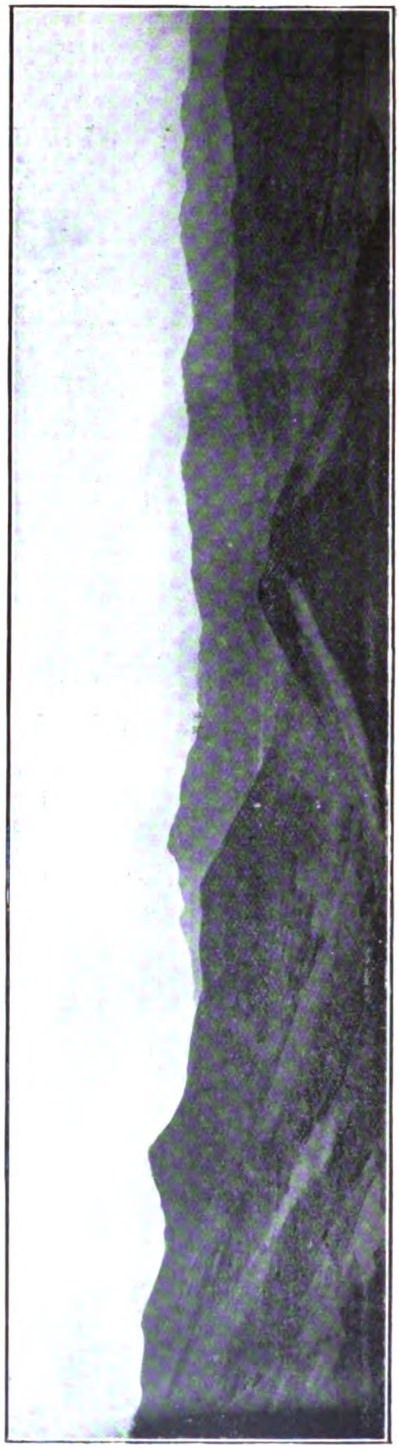


Panorama from Lung-mean-wo, shewing gap, Mount Rinchiatun and Tafangshin hill on right.



Panorama looking South from High Hill, East of Ta ling Pass. Rail runs down valley on right.

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out. Improvised Maxims of five rifles fixed in a wooden frame had wires from each bolt leading to one handle, and a piece of wood lying along the triggers was connected by wires with a lever which on being pressed fires the five rifles simultaneously. There were also wooden mortars used by the Japanese in the firing line to throw tin canisters containing some high explosive, the exact nature of which I could not discover. The mortar was simply a wooden barrel about two feet long and with a diameter of about four inches and was bound round with withies and mounted on a sort of toy carriage. In front of the building outside were ranged guns of all descriptions, many battered and broken. The Field Howitzer about 5 in. diameter appeared simpler than ours and had a broad flat spade underneath the axle. The latest field gun was dated 1902. All round the buildings ran a fence formed of various patterns of wire entanglements, abattis, obstacles, live wires, boards studded with nails, trous-de-loup, &c., while specimens of palisades, trenches, revetments, and loopholes used in the field were also shown, and on the slopes behind were types of land mines and fougasses. It was altogether a most marvellous exposition of war matériel and at the same time a striking testimony to the ingenuity of the Russian engineers in devising such implements and to the bravery of the Japanese in finding ways and means to overcome them.

203 Metre Hill:—

The hill has two peaks, 203 and 210, separated by a col about 100 feet lower, where the Japanese placed two 4·7 naval guns in a sandbag battery after they had captured the hill. The semi-permanent works crowning the peaks were demolished by the shell fire, the guns on the East peak being buried three feet or more in the ruins. Three lines of trenches ran round the hill and in front were wire entanglements. Under the col between the two peaks the Russians had quarried a tunnel connecting the trenches for supports in rear of the hill with the firing trench in front. The Japanese attacked the hill from 174 Metre Hill, facing 203, and forming the other side of a narrow valley. The approaches ran sideways down the hill into the bottom of the valley whence they worked up the slope of 203. From the top of 203 the whole extent of the harbour is disclosed and everything placed absolutely at the mercy of guns controlled from the summit. On the way out we passed the stables, barracks, and gunpark of a battery. The stables were well ventilated, lofty buildings, with stalls for 112 horses in each in four rows, two down the centre, and one along each side, with mud floors, and divided each from each by swinging bales. The mangers were wooden, and I saw no provision for water. In the centre of each building was a large room probably for forage or harness, but I saw no pegs for the latter. The gunpark and barrack rooms lay close by and the whole arrangement was very compact.

Golden Hill Fort:—

Golden Hill fort is on the East side of the entrance to the harbour. The fort had apparently suffered very little damage. Three

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11″ howitzers were in a battery on the top and several emplacements were empty, while down on a spur towards the sea front was a battery with four, I think, 10″ guns, and two small Q.F's flanked the entrance from a position close to the water line.

Harbour entrance:—

The entrance to the harbour is only about 100 yards wide and on the rocks at each side were lying the remains of the merchant vessels sunk both by the Japanese and the Russians to block the entrance.

Town:—

The town did not show many traces of the Siege, only an occasional burnt out house, or shell holes in a roof.

Land defences:—

On the Eastern side of the defences were a series of forts placed on the spurs projecting Northwards from the range of the hills, which runs in a rough semicircle from the railway to the sea. On these spurs not occupied by forts were semi-permanent works, and the ground between was covered with trenches. All the forts were on the crests of the spurs and no effort appeared to have been made to make use of indirect fire in connection with the heavy guns, consequently nearly all the Russian guns of position offered a beautiful mark to the Japanese gunners. The Japanese batteries were well placed behind hills, &c., and were fired by indirect methods. I was told that the only heavy shell which did any damage to them shifted a howitzer about 30 degrees, having landed on the concrete bed.

Shishusan Fort:—

Shishusan fort lies immediately East of the railway. The Japanese had occupied the glacis by sapping, then tunneled into the ditch and captured it, and then had run a mine under the parapet at the salient and blown it up. I was told that over 250 Russians had been buried in the ruins by the explosion alone. The whole, though solidly built of concrete, was absolutely wrecked. The trace of the ditch and the general outline of the place were visible but no interior details could be made out. The glacis was like a ploughed field with trenches and the parapet a rubbish heap with a huge crater where the mine had been exploded. The Chinese peasants had contributed to the disorder by digging among the ruins for wood.

Ehrlungshan:—

Ehrlungshan, the next fort, was in a similar state of ruin, the Japanese having captured it in much the same way as Shishusan. The mouth of the tunnel was under the crest of the glacis and had been cut out of solid rock.

Observatory Hill:—

Observatory Hill to the East of Ehrlungshan is the highest point of the range. Here the Russians had mounted two 6″ (approximately) naval guns on circular mountings. It must have been a stiff

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View from Shisusan—East.

Front ditch of Shishusan.

View from Suishusan West. Continuation of above.

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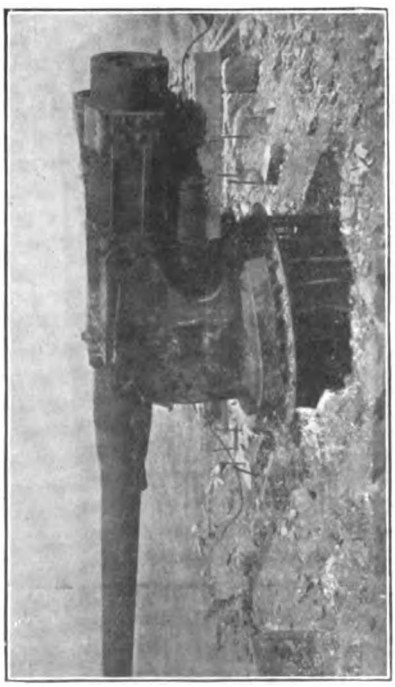
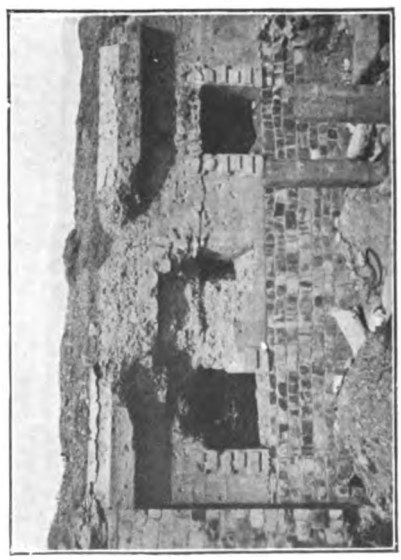
Ehrlungshan Fort. Jap tunnel.

South West Ditch. North Fort.



Guns on Observatory Hill.



Casemate—North Fort.
Where Kondrachenko was killed.

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job getting them up the hill as the slope is very steep, and the summit is so narrow that the gun platforms had to be anchored down the front with wire cables. The guns were poised right on the summit of the hill, so the Japanese with well directed shots had put them both out of action. One gun had about a foot knocked off its muzzle, the other had a dent in the barrel just behind the trunnions. A shell was jammed in the bore precisely at that spot and I wondered if by chance the Japanese projectile had struck the gun at the very moment the shell was passing down the bore. There were several lines of sandbag entrenchments on the hill, and along the foot of the front slope runs the Chinese wall, about 10 feet high and 12 feet thick, behind which the Russians had constructed many bombproof shelters.

Penlang Forts.—Takushan:—

In front of Ehrlungshan and slightly an the East lay West and East Penlang forts on lower spurs, and away across the wide valley in front of them stood up Takushan Peak behind which the Japanese 11th division had its headquarters.

Kikwan:—

To the North East of Observatory Hill and separated from it by a narrow valley is North Fort or Kikwan where the Japanese say that Kondrachenko was killed; the salient of this fort had also been destroyed by a mine and it was nearly as much a wreck as the others, only the flank ditches seemed to have escaped better than the rest. There was a small reservoir in the valley behind the fort and I noticed in all the forts I visited and also on 203 Metre Hill that the Russians had arranged an excellent water supply by means of pipes and pumps.

East Kikwan Fort:—

East Kikwan fort was never taken, and according to my informant was blown up by the Russians while peace negotiations were proceeding.

Sea Forts:—

Beyond this lay the sea forts, which I was not allowed to visit, except Golden Hill which has already been described.

The main point that struck me after seeing the forts was the state of complete ruin to which they had been brought by the combined action of shell and mine. The field of fire from all the forts was good and they mutually supported one another, but there was, as usual with such hills, a certain amount of cover in the nullahs formed by the watercourses as soon as they got out of the hard ground of the hills into the soft earth of the valleys. The way in which the Japanese had sapped their way right up to the glacis seemed to me little short of marvellous.

From an Artillery point of view the primary lesson seemed to be the necessity for using indirect fire. There were many positions in

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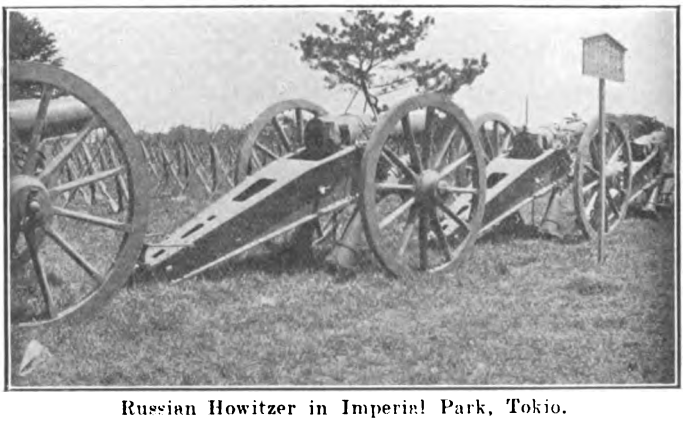
Salient, North Fort.

the valleys where the Russians could have placed batteries concealed from the Japanese view and sheltered to a great extent from their fire. As it was the Japanese batteries soon got the better of their opponents and the defence of the forts had to be confined to rifles and machine guns and such extraneous and devilish aids as hand grenades and bombs.

War trophies at Tokio:—

The Japanese have arranged a superb exhibition of war trophies in front of the Imperial Palace in the Imperial Park at Tokio. The Park is a large enclosure some three quarters of a mile long by half a mile wide with four large grass plots divided by broad gravel paths. In each plot were rows of Russian rifles piled in threes. Each plot again was bordered by a string of guns, naval quick firers, howitzers, field guns, maxims, ammunition wagons, limbers, &c., while down the road nearest the Imperial Palace where about a dozen heavy guns up to a 12″ naval gun, all on their proper carriages.



Russian Howitzer in Imperial Park, Tokio.

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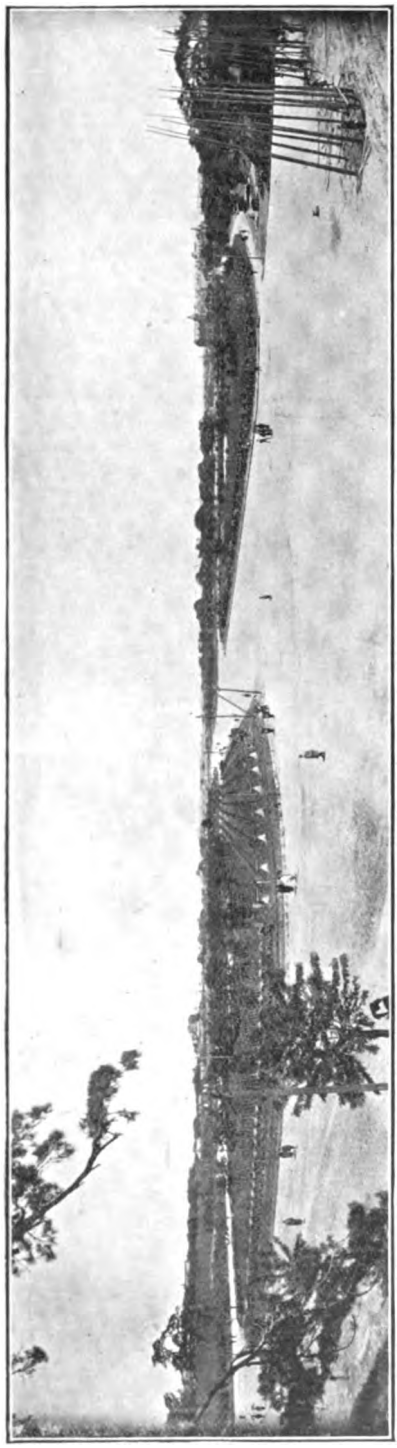

Trophies of war in the Imperial Park, Tokio.

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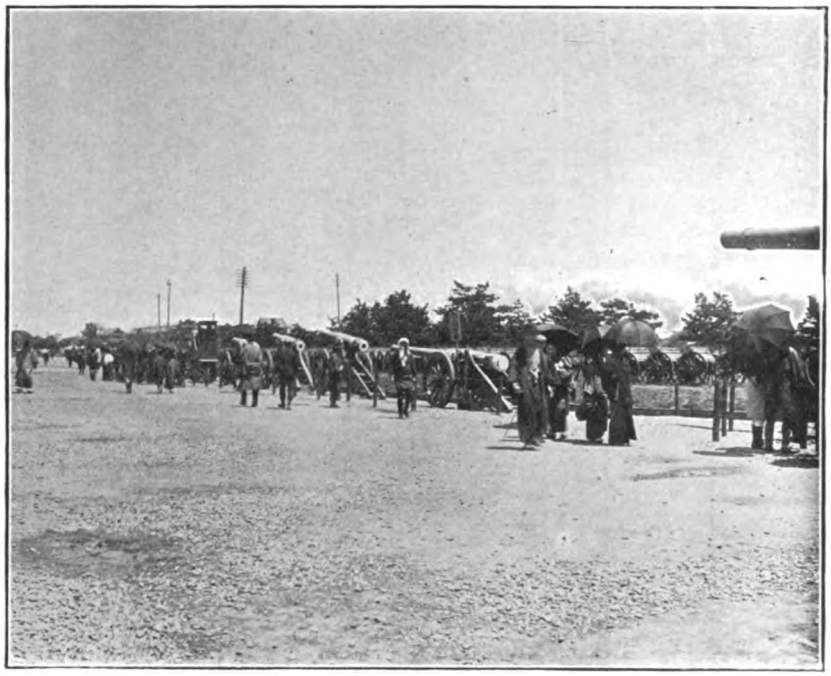
War Museum:—

The War Museum in Tokio is also very good and contains many relics both of the Chinese and of the late war. Even the wreath presented by the German Emperor to General Nogi after the fall of Port Arthur occupies an honoured place. On the walls are hung excellent pictures of the battles in Manchuria and portraits of famous soldiers.



Heavy guns in Park, Tokio.

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The Training of Personnel for Ammunition Columns.

By MAJOR G. R. TALBOT, Devon R.G.A., *(M.)*, Captain R.A., (retired).

WITH the introduction of the new Field Army Scheme, it is proposed that the personnel of all Ammunition Columns shall be found to a great extent by the Special Reserve which is to be formed from the present existing R.G.A. Militia. It would be out of place here to discuss the merits of this innovation, which has much to commend it. The war in South Africa is the only war of recent years in which Ammunition Columns have been utilized to any extent by us, and then chiefly as a reserve of men and horses to the batteries they supplied, and as a sort of perambulating cloak-room for all gear that the batteries could not carry themselves.

The question of the supply of ammunition was, except in very few cases, never a very serious one, and as a rule it was generally necessary to sacrifice the ammunition carrying power of the columns to the replacement of casualties among the officers, men, and horses of the batteries. Hence we find the Ammunition Columns which left England in November and December, 1899, at full strength, with complete personnel, transport and horses, soon reduced to a few buck wagons drawn by mules, and a section of ox wagons travelling by night, half a day's march benind the guns or even more.

This was all very well in South Africa but what are we to expect in the next campaign which may be a Gunner's war! Judging by the experiences obtained in the Russo-Japanese war, the Ammunition Column is likely to take a very much higher place in importance than heretofore.

Magazine rifles, machine guns, Q.F. guns and guns of heavy calibre all mean an increase of ammunition to be carried, while actions lasting several days are of by no means uncommon occurence.

The Ammunition Column under these circumstances becomes all-important, and the commander of a force in action, who knows he can depend on his Ammunition Column Commanders to get up their supplies by hook or by crook, whatever may be the difficulties, must have a heavy weight removed from his already troubled mind.

Now, until recently an Ammunition Column, when mobilized for war, consisted of a large number of Reservists from all parts of the Kingdom, many of them having had no training for years, and certainly none in their special duties, officers taken from batteries and depôts just when they could least be spared, horses from anywhere,

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wagons, harness and equipment out of the store where they have been lying perhaps for years, harness never handled and, therefore, most difficult to work with, and everything suffering from want of use. The C.O. recently appointed, probably a complete stranger to his other officers, N.C.O's and men, and the horses collected in a hurry from anywhere, and not of the best if the mobilizing batteries have had a look in first. Surely this cannot be a sound method of creating and mobilizing what is to be one of the most important units of a Field Force.

In order, therefore, that an Ammunition Column shall meet the present requirements it is evidently necessary.

(1). That the personnel must be previously trained to its duties in war during peace time.

(2). That the unit must, at all events, as regards officers, N.C.O's and a certain proportion of men be kept intact as far as possible when in the field.

(3). That in order to work harmoniously the unit must have a peace footing of some kind on which to form its war establishment on mobilization.

It must be borne in mind that an Ammunition Column is one of the most independent units in a force. Once operations commence the A.C. Commander is generally left to his own devices and all his business is to get near enough to, and keep touch with the units he supplies. He must use his own discretion as to filling up wagons, detaching sections, halting and marching. Again, officers and N.C.O's in charge of wagons may be ordered to carry out difficult duties without detailed orders, and must rely on their own common sense as to the best means to do so.

To quote examples, I remember meeting a young officer of an Ammunition Column dumped on the veldt near Paardeberg, after the advance to Bloemfontein had commenced, with 150 rounds of howitzer ammunition, three days rations and a couple of men. His orders were to get picked up by the next convoy that came along and join Head Quarters when he could. Another occasion when the pursuit of DeWet North of the Vaal was taking place, three Brigade Ammunition Columns were practically left to their own devices with orders to march as fast as they could after the fighting troops, and I think I am right in saying that for nearly a week hardly a single order was received by the Commanders. They were able to follow in the track of the troops, and eventually joined the main body at the first check.

Briefly, therefore, the chief qualifications necessary for the officers, N.C.O's and to a lesser extent the rank and file of an A.C. are:—

(1). To be a good scout with a good eye for country, accustomed to find his way by day or night, able to read a map, use compass and stars.

(2). *Horse Mastership.* Care of animals, resourcefulness in watering and feeding them and in their general care.

(3). Knowledge of ammunition, marks on boxes, weights, load-

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ing and unloading trucks, packing of wagons. N.B. (By the latter I mean filling up Q.F. ammunition wagons or S.A.A. carts from G.S. wagons and packing G.S. wagons from rail or ammunition stacked in bulk. All of which is merely a matter of drill but none the less important all the same).

(4). Signalling and picking up communication. Use of telephones, which will probably form an important part of field equipment in the near future.

(5). Knowledge of a certain amount of engineering—making good drifts, fords, bad pieces of road, bridging small streams, passage of obstacles generally. Ability to entrench a small post or laager for defence.

(6). Knowledge of gun drill, proportionate to rank, sufficient to take the place of a casualty in a battery, or emergency but not necessarily a specialist.

(7). Use of rifle.

(8). and finally. Self reliance generally speaking; able to take care of men, horses and vehicles under charge. Quick to take advantage of local conditions and know what to do if stranded in a strange country.

The above appears at first sight a formidable list, but nevertheless it is only what the personnel of Ammunition Columns in South Africa got to learn after several months experience.

Of course not every man can be expected to be in possession of all qualifications, but each N.C.O. and man should be specially trained at the job he shows most aptitude for, such as signalling, telephoning, ammunition packing, scouting, &c.

Once a man has been trained to perform certain duties with his column, it is obviously unfair to take him away to do duty with a battery, and, therefore, if, as is only natural, batteries are to call on Ammunition Columns to replace their casualties, a separate section of men and horses should be formed for that purpose alone, and every effort should be made to keep the column intact as regards its C.O., commanders of sections, Staff-Serjts., Serjts., signallers, scouts, and at least one man per vehicle, who should be in charge of it and its contents.

The men and horses of the supplying section would of course be available for general duties with the column until required by batteries, and their places taken by men from the base depôts when possible.

Every permanent N.C.O. above the rank of Bombardier should be trained to act on his own initiative. They frequently would be sent with two or three wagons to join a certain unit, which they have to find by day or more often by night. They must be able to use their eyes and ears and ready for any emergency.

The question of engineering is an important one. In South Africa, while running a column, I adopted the following scheme which proved most useful. I always had a couple of scouts about a quarter of a mile in front, when they came to any obstacle such as a drift, donga, or bad bit of road, they reconnoitred to see if any better place could be found. If they came to the conclusion, that with a little

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work the crossing of the obstacle could be improved one man came back and told me. The leading wagon, usually the least loaded, carried a certain number of picks and shovels. All spare men on other wagons came to the front and frequently after five or ten minutes work either at cutting away a bad mound, filling in ruts, an easy crossing was made not only for the column, but in many cases for the ambulance wagons and other transport following behind. Frequently by leaving the beaten track and moving 200 or 300 yards to the right or left, a better route can be found, and an enormous amount of time saved.

As an example of the above, I might mention one particular occasion, when, while trekking North of the Megalies Berg, we came one morning to a nasty boggy spruit—the whole of the transport of an Infantry Brigade was parked in front of this, and wagons were being got over one by one with the greatest difficulty, and the mire was getting worse and worse. There was no chance of outspanning and the rear wagons moved up twenty yards or so every five minutes. Seeing the block in front I sent out my scouts who were excellent men and in a few minutes one of them returned and said he thought with ten minutes work we could cross about 300 yards lower down. The stream here had banks about two feet deep, but they were not boggy. Up came the Pioneer wagon as we called it, and in less than twenty minutes all my wagons were safely over and being followed by the rest of our brigade transport. The result being our animals had a good outspan and graze for about three hours instead of about half an hour which they would have had, had we waited our turn at the bad place.

The dealing with ammunition requires a certain amount of practice. A badly loaded wagon or cart makes a bad strain on the team, and on the wheels. Varieties of ammunition are liable to be mixed up, especially in the dark, and although now with shells already fuzed and fixed ammunition, mistakes are not so likely to occur, yet such mistakes have been known to occur such as sending 15-pr. ammunition to 12-pr. guns. The rapid filling up of Q.F. wagons is also important, and wants practice to make it perfect.

From the above, I hope it is made evident that Ammunition Columns do want training in peace time and in future they cannot be left till the last moment to be organized. With the new system coming into force, a good opportunity presents itself to draw up a system of training the personnel in the duties they will be called on to perform in war time.

Let us suppose, therefore, that the training of the new Reserve Field Artilleryman consists of:—

(1). A preliminary training of six months. With a training battery, more or less it is to be hoped under the supervision of one of his own officers.

(2). Annual training of three weeks to a month.

During the former the recruit is set up, and taught the general ideas of cleanliness and discipline, he is taught to ride and drive if a driver, or gun drill if a gunner. He learns something about horses,

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fires a recruits course of musketry, and is initiated into some of the mysteries of Ammunition Column work.

During the annual training, the O.C. Ammunition Column after all his N.C.O's and gunners have passed in gun drill, devotes his time to training his column as such.

Entraining and detraining, loading wagons, keeping touch with imaginary batteries, or battalions (represented by mounted men with flags), crossing obstacles, laagering, night marches, &c., must all engage his attention. It is not much use encamping an Ammunition Column in a ten acre field without good rough country such as Dartmoor or Salisbury Plain to manœuvre over.

Specialists i.e. scouts, signallers and telephone men should be allowed to attend a month's course during the winter at headquarters.

Artificers are a very important part of the Column, especially shoeing smiths for which there is a constant demand (as for example during 1900-1902 when a big bounty was paid to civilians to enlist for one year).

All artificers might be allowed to join the training batteries for an extra month in the year to work in the shops. They would thus get an insight into Regulation methods of shoeing, into carriage work, and repair of harness, &c., as the case might be.

As regards the training of officers. Every officer on first joining should do six months duty with the training battery, not necessarily in one period but if more convenient spread over a year. One officer per column should always be doing duty with the recruits of his unit, and a permanent Militia Adjutant to run the recruits at each centre should be appointed. Officers should be allowed to do a month's course every year or two, and attend schools of instruction, and practice camps if anxious to improve their military knowledge.

It might be of advantage in many districts if the permanently employed Special Reserve officers were to register transport horses for the use of their columns on mobilization within a certain radius of their headquarters. This would cost little beyond the registration fee say 5/- or 10/- a horse per annum, and the advantage of having the horses close at hand on mobilization, and up to strength would be enormous.

I have not touched on the question of mechanical transport, which would appear to be absolutely necessary, if the size of the Ammunition Columns is to be kept within reasonable limits. The adoption would mean the enlistment of mechanics instead of drivers for such vehicles. At the same time drivers are always in request, and the reserve section should be well supplied with them.

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The application of Lieut.-Colonel A. ff. Powell's Rules for calculation of Angles of Sight, and Apex Angles, to Artillery in the Field.

By MAJOR J. G. GEDDES, R.F.A.

Lieut.-Colonel A. ff. Powell, D.S.O., R.G.A., in his paper published in the R.A. Journal, Vol. XXXIII., No. 12, of March, 1907, has given us a couple of rules which may be found useful for artillery in the field.

Angle of Sight:—

The angle of sight from a battery firing from a concealed position on a target whose height above (or below) the battery can be ascertained from a reliable contoured map, and whose range is known, can be estimated by means of Colonel Powell's rule, thus:—

Let B be the battery, T the target, R the range in yards, and H the height of the target in feet above (or below) the battery.

Formula:—

$$\text{Angle of sight degrees} = \frac{H}{\frac{1}{20} R.}$$

Example:—

Let R = 3,600 yards.

Let H = 270 feet above battery.

$$\text{Angle of sight} = \frac{270}{\frac{1}{20} \times 3{,}600} = 1\tfrac{1}{2}^{\circ} \text{ elevation.}$$

Apex Angles:—

The rapid estimation of apex angles is of growing importance to artillery in the field, when firing from concealed positions, and the observation of fire cannot take place in the immediate vicinity of the battery, in order to obtain the direction of the target, or to switch fire on to another target, more especially in cases when double displacement comes in as described in amendments to F.A.T., Chap. IV., Sec. 25, (iii).

As stated in the subsection mentioned above, the simplest way of estimating an apex angle is by remembering, or having handy for reference the table given in F.A.T., Chap. I., Sec. 21, (ii). Namely:—

	100 yards measures
At 2,000 yards	3°
„ 3,000 „	2°
„ 4,000 „	1½°
„ 5,000 „	1° 10′
„ 6,000 „	1°

Or by making use of a table of displacements as follows, and ascertaining by inspection:—

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Range.	Displacement.				
	100	200	300	400	500
2000	3°	6°	9°	12°	15°
2500	2½°	5°	7°	9½°	12°
3000	1½°	3°	5°	7°	8°
4000	1½°	3°	4½°	6°	7½°
4500	1½°	2½°	4°	5°	6°

But in event of such tables not being at hand, apex angles can be calculated from Lieut.-Colonel Powell's rule as follows:—

Let D = displacement in yards of observer from flank of battery.

Let R = range in yards.

Formula:—

$$\text{Apex angle in degrees} = \frac{D \times 6}{\frac{1}{10} R}$$

Example:—

Displacement = 150 yards, (usually estimated by eye).

Range = 4,500 yards.

$$\text{Apex angle in degrees} = \frac{150 \times 6}{450} = 2^\circ.$$

The foregoing formulas may seldom be used by batteries in the field, but it is thought that they might well find a place, say pasted inside the lid of the binocular case for reference if required to be worked out in the Battery Commander's, or Battery Serjt.-Major's note book.

Letter from Major Norman Ramsey, Horse Artillery.

Communicated By MAJOR E. C. HAWKSHAW, R.A., (retired).

The following letter from Major Norman Ramsay, Horse Artillery, was sent to Lieut.-Col. Edward Hawkshaw, 31st (Huntingdonshire) Regiment, Commanding 7th Portuguese Caçadores, during the Peninsular War, shortly after the battle of Albuera where Col. Hawkshaw had his thigh shattered when leading the final and decisive charge.

Camp near Avouches,
19th July, 1811.

My dear Hawkshaw,

It is only this instant that I have been informed by Wooldridge that you are in Lisbon, and I seize the pen at once to condole

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with and congratulate you. The real heartfelt sorrow occasioned by the frequent reports which reached us of your death could alone surpass that which we all experienced on hearing of your severe wound. In God's name what bright characters in the shape of medical men have been attending you only *now* to discover that your thigh is broken? Poor fellow! I fear you have suffered much; you have, however, two great sources of consolation, viz. the consciousness of having performed your duty, and the infinite honor which both battalions of the gallant three L's have reflected on you Their "discipline" and forward bravery in the battle of Albuera is in the mouths of everybody, and, believe me, your friends, knowing the fatal prejudice which once existed in the breast of a certain great Marshal were not at a loss to account for the great deficiency of praise in behalf of both you and them.

* * * * * * * * *

We have just received orders to march "back again" to the neighbourhood of Castello Branco. There are various reports flying about the movements of the enemy, but I am inclined to believe that they intend laying on their oars for some time, as we shall do.,

The 3rd, 5th, 6th & 7th Divisions have passed through this place on their way to their several cantonments. We march tomorrow. We all regretted the death of poor Boleman much.

I have not a word of news to give you, and I have written this letter merely that I might know how you really are. Now mark me, my dear friend, much and anxious as we all are to know how you are going on, we would sooner do anything than you should attempt to put pen to paper unless you are fully equal to it, and we shall be perfectly satisfied if you will just desire your servant or anybody to write two lines to say how you are. Direct Head Qrs. The whole of our bucks desire to be most kindly remembered to you and join me in the sincerest wish that your speedy recovery will enable you again to fill that post which I am confident your enthusiastic heart eagerly desires. I need not name it.

God bless you then, and believe me with the truest regard,

Your much attached friend,

W .N. Ramsay.

How I long to see you.

(Direction)

H. M. Service

To Lieut.-Col. Hawkshaw,

L. L. Legion

Lisbon.

W.N.R.

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Barr & Stroud Rangefinder, F.Q. Type, "Infantry," 31½ inches (80 cm.) Base, for use with Infantry, Cavalry and Machine Guns.

The approximate uncertainty of observation with this rangefinder, at a range of

600	yards is	2	yards.
1,000	,,	6	,,
2,000	,,	24	,,

BARR & STROUD,
Anniesland,
Glasgow.

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"DUNCAN" GOLD MEDAL ESSAY, 1907.

"To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations, and what rules should govern their tactical employment?"

By MAJOR H. S. JEUDWINE, R.A.

"NEC TEMERE, NEC TIMIDE."

ARRANGEMENT OF THE SUBJECT.

PART I.—Introduction. Influences which have affected the calibre of Artillery in field operations in the past, and which have governed opinions as to the future usefulness of heavy guns and howitzers.

PART II.—The influence of the tactics of the other arms on Artillery. General deductions from the most recent experience.

PART III.—Can heavy guns and howitzers co-operate usefully in field operations under the circumstances which are likely to occur, and to what extent can they do so?

PART IV.—Tactics.

PART V.—Summary.

PART I.

Introduction,—Influences which have affected the calibre of artillery in field operations in the past, and which have governed opinions as to the future usefulness of heavy guns and howitzers.

The theme of this essay involves the discussion of a matter which has exercised Artillerists since Artillery as an arm began its existence. For at least 200 years the vexed question of calibre versus mobility has been debated and re-debated. The term calibre in this connection is employed as a synonym for power. Calibre has intrinsically no virtue of its own.

Power and mobility are both essential to an effective Artillery, but each is directly antagonistic to the other. The problem, therefore, of which the solution has been so incessantly sought is that of combining power and mobility in exactly those proportions which will produce weapons most suited to the normal conditions of warfare. It is obvious that if these conditions alter the proper admixture of power and mobility must alter with them. That they do alter admits of course of no doubt.

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Improved communications, due to better and more numerous roads and the introduction and increase of railways; improved material, resulting from fresh discoveries in explosives and metallurgy; new inventions and mechanical devices—in fact all the influences to which the development of science and civilization are due—tend to modify the conditions under which war is waged, and the demands made on those who carry it on, and on the means which they use to do so.

For some time after the birth of Artillery as an arm this development was a slow process, but in the last half century its progress has accelerated, and the rate of acceleration appears to become more and more rapid with each succeeding year. Moreover it is not only by the direct application of science to Artillery that new conditions are introduced. Artillery is the servant of the other arms and any change which tends to modify their tactics and the circumstances of their employment must infallibly re-act on the Artillery and alter its functions also. Napoleon said that tactics must be changed every ten years. In his age this implied great frequency of change.

In spite of the fact that the earlier days of Artillery saw few changes,—that for 100 years there was little appreciable difference in the conditions of war, and that for the next fifty the development was but slow—controversy raged keenly at times over the respective claims of power and mobility. The greatest Artillerists held sometimes the most divergent views[1] and the respective virtues of different calibres received in turn the support of authority and the seal of adoption.[2] The nett result in most armies was a heterogeneous collection of pieces of varied power and mobility which were used as occasion demanded, or as opportunity offered for their transport to the field of battle.[3] Thus we see that Heavy Artillery is in principle no new thing. Then came a reaction. The supply of ammunition was complicated to such an extent as to be unworkable and the necessity for simplification was universally recognized.[4] The result was the evolution of guns for field operations limited to one or two calibres, such as our 9 and 16-prs. and intended, as a compromise between the claims of power and mobility, to fulfil all the requirements of field operations. This state of things continued up to the outbreak of the late South African war, except that the guns had become 12 and 15-pr. breech loaders, and that a 5-inch howitzer had been somewhat tentatively added with a rather undefined rôle. But in that campaign the employment of more powerful ordnance in the field by our adversaries, and subsequently by ourselves, re-opened the vexed question, and rekindled doubts which have smouldered ever since, and to

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1 See "Etudes sur le passé et l'avenir de l'artillerie."—Napoleon III., continued by Favé.

2 Bouquerol in "The tactical employment of quick firing field artillery" quotes General Muller's saying that "immediately after a great war there is always a demand for increased power, during long periods of peace, on the other hand, this attribute is little by little relegated to the background, and we find the tendency to increased mobility making its way to the front."

3 For example we find the following ordnance used in the campaign in Flanders in 1747:—

12-prs. heavy	6	6-prs. short	12
10-prs. "	3	6-prs. saxon	6
9-prs. "	6	3-prs. "	5
6 prs. long	8	8" howitzers	2

("Dickson Memoirs").

4 "Etudes sur le passé et l'avenir de l'artillerie."

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which fuel has been recently added by the experiences of the Manchurian contest. A discussion of the matter under terms not unlike those governing the present essay, took place in the " Proceedings " of the R.A. Institution as a result of the subject set for the " Duncan" Essay for 1901. At that time, however, the subject was perhaps hardly ripe for discussion. The arguments adduced necessarily bore reference mainly to the experiences of the South African war which was still in progress when the essays were written. There had hardly been time to realize the trend of these experiences and to appreciate the lessons for the combined action of all arms which they indicated. Moreover the theatre of operations, the strategy and tactics of our enemy, the strength of the Artillery and other forces opposed to us were not of a kind which we can regard as typical of those we must normally be prepared to encounter. The lessons of South Africa therefore appeared to require further confirmation before they could be accepted implicitly. More lately, however, we have had the privilege of observing the influence of new weapons and material on the conduct of a protracted conflict between two great nations in arms. As a result of this we ought to be able to look somewhat further into the future than was possible only a short time ago, and to forecast what our own requirements will be should we be called upon shortly to enter into a struggle of a similar kind. It is not to be expected, however, that finality can ever be reached in such a manner. Progress will be continual, and changes will follow on progress in the future as they have in the past. These changes will demand a periodical reconsideration of all war organisation, and of Artillery equipment and tactics among the rest.

PART II.

The influence of the tactics of the other arms on artillery. General deductions from the most recent experience.

Since Artillery does not fight by itself, but only as the coadjutor of the other arms, we must examine the tactics of these if we wish to discover what Artillery we ought to put in the field in order to afford them the most complete co-operation. Were we to begin with a clean slate, and attempt to arrive at a decision as to how many different natures of guns are required, and what the precise attributes of each should be, the task would be too immense to be compassed within the limits of this essay. Fortunately we are confined to the consideration of calibres " greater than those of our Field Artillery." We may, therefore, ignore entirely the action of cavalry operating independently, since it is obvious that in the present state of our scientific resources guns of greater calibre than our Field Artilery could not be endowed with the requisite mobility to accompany independent cavalry. Cavalry acting otherwise than independently is just as much an auxiliary to infantry as Artillery is. It is therefore on the requirements of the infantry alone that we must base any argument for or against the employment of guns or howitzers of greater calibre than those of our Field Artillery.

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The " Artillery duel," the solemn grandeur of which our imagination pictured with the help of text books and the histories of great campaigns, is a thing of the past. Long ranges, smokeless powder and quick-firing guns have killed it. A battle at the present day is begun, continued, and ended by the infantry; but the Artillery must be beside them from start to finish, never slacking its efforts to support and protect them. Should it cease for a moment to watch over the infantry, their losses, if the opponent's Artillery be well served, will be severe. Defeat and even annihilation may ensue.

The action of the infantry in warlike operations of the present day is therefore an index to what is required of the other arms, and we must take into account in the first place what the task of the infantry will be if we wish to understand the demands which will be made on the Artillery.

It will accordingly be convenient at this stage to examine the circumstances attending field operations generally, by the light of the latest experience, so as to discover what new features recent progress in warlike science has introduced.

The use of cover.

One of the first things which strikes us is the extent to which cover, natural and artificial, is made use of. A tendency towards an increased use of cover became apparent early in the South African struggle, and the value of it both in attack and defence was soon impressed on us by bitter experience. At the end of two and a half years the lesson appeared to have been absorbed by all concerned, and there was certainly little sign of a desire to depreciate the benefits of earthworks, blockhouses, etc. But once back on the old drill grounds, beyond the range of " long toms," and out of hearing of the mauser, officers began with one accord to question the value of their recent experiences. It became the fashion to speak of them as exceptional, and to disparage their usefulness as a guide to the future. These experiences did certainly tinge our drill books, but as time went on the tint began to fade. Then came the war in Manchuria. Cover was used on a scale undreamt of even in South Africa, and we read with astonishment of the extent to which trenches and gun pits were called into play, and of the uncompromising shapes which they took. Again experience of war began to colour our opinions and our drill books.

But now Manchuria is behind us, and once more the word " exceptional " is becoming a convenient adjective to some students of Manchurian teaching. It is so easy in barracks to comment sarcastically on the folly of immobility, to deprecate the want of enterprise of the Japanese, and to condemn the apathy they exhibited in allowing their opponent time to burrow deeply into the soil.

It is the firm conviction of the writer that the use which was made of cover in the two campaigns referred to was not exceptional in any sense, but the logical sequence of recent progress in arms and war material.[1]

[1] Compare General Rohne on "The Progress of Modern Field Artillery" (1905.) This author shows that an increased use of entrenchments is a logical outcome of improvement in fire-arms. He also maintains the necessity for special artillery to deal with them.

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The following are the reasons put forward:—

(i). In all operations, and in every phase of them, one side must act tactically on the defensive, the other on the offensive. Defensive action implies the desire to delay. Cover aids the defender to delay. Cover from view makes it difficult to locate the points which are held, to determine whether they are strongly held, or weakly, and to distinguish those features of the ground which form the keys or pivots of the defender's position. Cover from fire enables the defenders to withstand the tentative opposition which the attacker must resort to in order to obtain information, and with a view to inducing the defender to disclose his dispositions.

(ii). The value of cover to the defender increases in direct proportion to the effective range of firearms. Formerly, when musketry was effective only within 400 to 600 yards, and Artillery fire at less than double these ranges, the time taken by the attacker to pass through this distance, and consequently the time during which he was exposed at a disadvantage to the effective fire of an intrenched defender, was relatively insignificant, and the effect produced hardly repaid the trouble of digging trenches. Now that these distances are increased nearly tenfold the time occupied by the attacker in crossing the dangerous zone is increased also, and the loss that can be inflicted by a defender who is himself protected from serious loss is proportionately greater.

(iii). The result of these long ranges, and of the loss which a defender with modern weapons can inflict on the attacker, is that the latter is forced in order to avoid annihilation also to have recourse to cover either natural or artificial.

(iv). It follows from (i), (ii), and (iii), that a battle between any considerable numbers of troops, if fought to a finish, must be protracted. Staying power, moral and physical, will be the main requisite for success. If the defence succeeds in wearing out the attack there must, unless a successful counter attack is undertaken, be a lull during which defences can be strengthened and renewed in view of further hostilities. If there is a successful counter attack the respective roles of attacker and defender may be exchanged, but the peculiar properties of each will not be altered. If the attack succeeds, the attacking forces will no doubt strain every nerve in pursuit, but after such a struggle a vigorous pursuit, unless fresh troops are available to carry it out, will be impossible. Rest for the worn out battalions who have been engaged in attack, and opportunity to refit will be indispensable. The defenders will probably make good their retreat, and will be at liberty to fall back on other positions, with time at their disposal for constructing fresh defences, and for repeating the same programme.

(v). Another factor in modern war which, in addition to the reasons given in (iv), tends to impose an interval between

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important conflicts is the increased difficulty which the complex armies of our day find in leaving the vicinity of a railway. The large supplies of ammunition and other stores which an army now demands can only be satisfactorily delivered to it by railway. Operations must, therefore, in nearly all cases follow a railway system. The retiring force will have a railway at its back to aid its withdrawal. The advancing side will find the railway in its front destroyed, and will have to make the line good as it goes forward. It is true that active cavalry may harass the retreat, but alone they cannot destroy an army unless it is utterly disorganised. Crushing victory may be possible if they can throw themselves across the rear of the defeated force before retirement actually takes place, but failing such signal success a retreating army should be able to outdistance pursuit without difficulty, and will have leisure to fall back on positions in rear, and to put them in their turn in a state of defence.

For the above reasons it is contended that the use of cover on a large scale will be a feature of campaigns in the immediate future. These contentions received full illustration in Manchuria, but it seems to the writer advisable to go rather fully into the reasons for advancing them, since the justice of them is not universally admitted.

Effective ranges.

The high velocities which firearms possess at the present day, and their consequently increasing ranges and flatter trajectories have great influence in battle. The long range, combined with the use of smokeless powder, makes it often impossible to ascertain the locality from which fire is coming, and thus prevents effective reply. The flatter trajectory and consequently deeper danger zone allows a larger margin of error for the burst of shrapnel, and as regards musketry fire increases the difficulties of the attack during the last stages and in the assault by rendering the defender's fire proportionately more deadly.

These points are so well recognised that it is unnecessary to labour them. It is probable that the last word in flat trajectory rifles has not been said. The latest German rifle is, it is understood, in advance of all others in this respect.[1]

Difficulty of locating the enemy's position.

This, the result of long ranges, smokeless powder, and the use of cover, has already been incidentally brought to notice. It deserves, however, full emphasis on its own account.[2]

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[1] "The flat trajectory of the magazine rifle, smokeless powder, and the quick firing field gun have wrought a greater change in tactics than did the substitution of the breech-loader for the musket, and of the rifled cannon for the smooth-bore . . . . Nowadays the ground for 900 yards in front of a strong line of infantry, provided that the rifles are held a few inches above the level, is so closely swept by the sheet of lead as to be practically impassable by men standing upright or even crouching. The long deadly zone of this horizontal fire, which every improvement in the firearm tends to increase, is the most potent factor in modern battle." "Tactics of the three arms combined." *Henderson.*

[2] Of little less importance (than the flat trajectory) is smokeless powder. The absolute invisibility of a skilful enemy renders reconnaissance tenfold more difficult than heretofore. Smoke betrayed not only the position, but the strength of the troops who held it; the new powder tells nothing." "Tactics of the three arms combined." *Henderson.*

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Duration of battles.

It has been argued that entrenchments will be more freely brought into play. These, when used by the defender, will enable the tide of attack to be stemmed for a longer period. When used in the attack, as recent experience teaches us they sometimes must be, they will occupy a certain time, however small, in construction, and troops once committed to their protection are inclined to cling to them, and to be reluctant again to face the storm of lead in a further advance. The difficulties of locating an enemy, to which reference has just been made, will extend the time required for reconnaissance and preliminary movements. The length of effective ranges will augment the width of the fire swept zone which has to be crossed. The holding power of the magazine rifle will enable the defender to occupy in succession, with small numbers, points relatively far in advance of his main line. Each of these must be made good in turn.

The duration of modern battles, therefore, is likely greatly to exceed that of the majority of classic examples. This fact began to be demonstrated in South Africa, even in the case of a defender who had no stomach to remain for the assault. It has received further proof on many fields in Manchuria where the stubborn valour of the Russians realised its truth to the full. Victory falls finally to the side which has the greater staying power and maintains longest its energy, physical and moral; which is imbued with a fierce determination to win, and a confidence in its own power to do so that no sufferings can shake.

Width of front occupied.

Another result of the power of modern firearms has been the wide extension of the positions occupied. Comparatively small detachments can exert a delaying effect out of proportion to their strength, and can conceal their want of numbers. Long ranges allow a succession of points to be occupied in or in prolongation of a position, each supported by and supporting those on either side of it with enfilade fire. Instinctive aversion to being outflanked is likely to prompt the defenders to make full use of this power, and, by extending the flanks of their position, to discourage and embarrass any attempt at envelopment. This tendency was apparent in Manchuria, and notably at Mukden, where the Russian position, consisting of a series of fortified points, extended over a front of about 100 miles.

Enfilade fire.

All accounts of operations in Manchuria agree in the supreme influence of enfilade fire, due to the long range and flat trajectory of modern weapons. Instance can be piled upon instance where fire of this nature decided the issue of an attack. Momentous results were over and over again achieved by relatively insignificant bodies which had succeeded in establishing themselves on the flanks of troops hitherto unshaken by frontal fire. The same effect was apparent in South Africa.

The following passage conveys a deep appreciation of the value of enfilade fire which subsequent events have entirely supported:—"Nor is greater accuracy without influence on *moral*. Enfilade fire,

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the most telling of all, is more easily brought to bear, and more deadly; while the knowledge that, if once they are outflanked, they can no longer reckon, owing to the range of the enemy's projectiles, on a secure line of retreat, tends to shake the nerve of the most stubborn fighters." (Henderson. Tactics of the three arms combined).

Enveloping attacks.

The enormous difficulty and danger of the frontal attack, and the increased importance of enfilade fire has encouraged the use of enveloping attacks—one might perhaps say has necessitated them. They were a striking feature of the Japanese operations in the late war, and the thoroughness with which they were prepared and carried out has been most marked. They differed from what we have been used to terming a flank attack in that the whole attack was carried out as one harmonious whole. The enemy was engaged along his whole front with as much determination as if the object was to pierce his line at all points, and in this way the transfer of troops from one part to another of the position was rendered difficult or impossible to the defender. Where the situation required it the Japanese showed no hesitation in throwing their last reserves into the fight in order to give their attack the necessary extention.

Their example cannot fail to have an effect on future tactics.

Night operations.

The difficulty of advancing over moderately open ground against a well posted enemy, due to the several causes which have been already mentioned, has brought night operations into a greater prominence than they have hitherto enjoyed. In many cases they may be expected to offer the only solution of the problem of advance against an enemy well entrenched, and provided with a clear field of fire.

The Japanese in Manchuria made frequent use of night operations to enable an advance to be made or an assault to be delivered which in daylight would have been too costly or impossible. But these operations differed in three important particulars from many of those which we undertook in South Africa. Firstly the distance over which an advance was made rarely if ever exceeded a mile. Secondly every inch of the ground was reconnoitred, step by step, up to the actual position of the enemy. Thirdly Artillery was brought into play by both sides in night attacks, and by all accounts succeeded in making its influence fully felt.

In the foregoing paragraphs of this Part the attempt has been made to trace the influence of new developments in tactics. The fact of their comparative novelty has necessitated a somewhat full consideration, but it is hoped that the space occupied has not been wasted. A clear understanding of their influence seemed to the writer to be essential to a logical treatment of the subject, since it is only by keeping this influence in view that a just estimation of what will be required of Artillery in the future can be made.

It may be as well to summarize very briefly the conclusions arrived at.

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1. Cover from view and from fire will be very largely employed in the defence. A certain amount of cover may have to be constructed in the attack.

2. Smokeless powder and the increased length of effective ranges hinder reconnaissance, and greatly delay the development of an action.

3. Greater accuracy and flatter trajectories much increase the difficulty and costliness of the attack during the latter stages, if the defenders are allowed to develop their fire to the full.

4. Long ranges and flat trajectories combined have made enfilade fire much more deadly.

5. Movement within effective range will be difficult, and advance or change of position will often have to be made by night.

6. The width of front occupied by the defenders will be very great compared with what has been considered suitable in the past.

7. It must generally be the aim of the attack to envelop the defended position.

8. The duration of battles will be very considerable.

9. Intervals between battles will be longer than in the past.

10. Main operations must follow a railway system.

PART III.

Can heavy guns and howitzers co-operate usefully in field operations under the circumstances which are likely to occur, and to what extent can they do so?

The struggle in Manchuria having been followed with so much interest by all civilised nations, and having been the occasion of so many books and so much discussion in the press, it might have been expected that Artillery questions would have come in for their fair share of analysis. This does not seem to have been the case, however. So far at least as the writer has been able to discover, the literature of the subject takes scant account of the action of Artillery generally, and entirely ignores that of Heavy Artillery in field operations.

Von Donat, in "The Battle of Mukden," gives the number of heavy guns employed by the Russians and Japanese as about 300 and 170 respectively. No reference, however, to their employment, other than the most cursory, is made. Beyond the fact that heavy guns were present we are without information direct from the battlefield (at all events without information that can be quoted in this essay)[1] to aid our reasoning. This is the more remarkable because there is evidence to show that some of the chief battles are regarded by experts as full of instructive teaching, and that eye witnesses have not been unappreciative of the great part played by Artillery, or unconscious that there are lessons to be learnt. To prove this the following extracts may be cited:—

[1] The Reports of Attachés, circulated to the Army, are not allowed to be quoted or referred to in the press.

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"The battle of Mukden was the biggest of all the fights in "the Russo-Japanese War, both as regards duration and num-"bers concerned. All the modern appliances for war and "the latest principles of tactics have been tested in that "battle; therefore the description of it by the most competent "authorities is most instructive. . . . ." Von Donat. Preface to "The Battle of Mukden," an account compiled from the reports of the German attachés.

"A feature of the campaign has been the overwhelmingly im-"portant part played by Artillery. . . . . The present war "teems with lessons, lessons that have been repeated time "after time, until they have stereotyped themselves on the "mind. The burden of these lessons is that the biggest "possible guns are the best; that the guns that throw the "biggest projectiles to the furthest distance at the quickest "rate are the only guns for any army that is destined to "conquer on the field of battle. There is no limit to the size "of guns except that imposed by the difficulties of trans-"portation." "A Modern Campaign." David Fraser, special correspondent to the *Times*.

Beyond the facts then that heavy guns were employed in great numbers in at least one of the battles, that that battle is considered by an expert as one from which valuable lessons may be drawn, and that an eye witness (although not a soldier) was profoundly impressed with the necessity of great power for Artillery, we have no data directly applicable to the question in point. We must work out our own deductions, reasoning from the general conclusions to which we have been led in Part II. This, however, should not be difficult since the main lessons are of such prominence that it is impossible to overlook them.

Advantages of heavy guns.

Guns of greater range than our field guns will be valuable for the reasons which follow:—

Infantry sheltered behind entrenchments and Artillery covered by shields and pits or epaulments cannot be harmed greatly by the frontal or nearly frontal fire of a flat trajectory gun. The fire of the infantry may be kept down by this means, but will burst out again the instant they are left unattended to. Short of assault, enfilade fire alone can force them to evacuate their position. But it will not be possible often to place large numbers of guns so as to outflank an enemy's line. The effect of enfilade fire must generally be produced by guns of long range firing at an acute angle with the general front. In order that they may be able to do this, and at the same time not be compelled to advance so close to the enemy as to run the risk of being themselves taken in enfilade and crushed by his quick-firing Field Artillery they must be effective at very long ranges. From the consideration we have already given to the effect of enfilade fire we know that the influence of such guns would be very great. It is obvious, however, that it is a postulate of such action that the range of the guns employed must be considerably greater than that of the Field Artillery opposed to them.

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Apart from the matter of enfilade, the power which these long range guns would give of bringing converging fire to bear over a wide front on any desired locality would be of immense value.

The length of modern lines of battle, and the wide extension of troops along them, accentuate this advantage.

" There is nothing which tends to produce so great a moral effect " as a heavy cross fire of Artillery. The best troops in the " world get shaken and demoralized by such fire . . . . the " shells search out the trenches or rifle pits. The effect of a " given number of guns placed so as to bring a converging fire " on a portion of the defender's position is very much greater " than if they merely brought a direct fire. A direct fire may " be more or less guarded against, but a cross fire on a posi- " tion produces the moral effect of an attack both on a flank " and in front." (Home. Precis of modern tactics).

" A converging fire will also be infinitely more effective than a " frontal fire, and troops in entrenchments, secure from the foe " immediately before them may yet be made to suffer heavily " if cannonaded from the flanks." (May. Achievements of Field Artillery).

" Its principle duty (i.e. that of Heavy Artillery), is to . . . . " search and enfilade points which the lighter guns can only " reach with frontal fire . . . . and in the final stages of the " attack to support the firing line, its great shell power and " long range enabling it to bring a powerful and concentrated " fire to bear on the points selected for assault." (Combined Training, 1905).

The latest Japanese training instructions for Artillery insist on the importance of oblique fire against shielded guns. Quotations to the above effect might be made from almost any text book or history of war, but further argument would be wearisome.

It will be noted that this value of converging or enfilade fire is no new discovery. The only wonder is that we and others have not adopted long range weapons for the purpose long ago. It is the increased use of entrenchments which to-day adds emphasis to our needs.

Moreover, apart from the matter of enfilade and converging fire, common sense teaches us that if we possess a longer ranging gun than our enemy we can so place it that we can hurt him while he cannot hurt us.

Guns of great shell power will be of advantage. The reasons for this are simple enough.

(i). A heavy shell is required in order that sufficient velocity may be retained at long ranges. Velocity is required to deepen the cone of effect of shrapnel by flattening the trajectory. A certain striking velocity also is required for shrapnel bullets to be effective.

(ii). The lateral space covered by the shrapnel bullets of a long range gun must be wide, otherwise there will be too great difficulty in hitting an object having relatively little width, such as a trench seen in enfilade.

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(iii). The long range guns which are proposed may have to be used against material. A large common shell with a heavy bursting charge will then be a necessity.[1]

Advantages of heavy howitzers.

As to howitzers one is rather at a disadvantage, inasmuch as a new field howitzer is under design, if not under trial; but what its calibre and other properties may be the writer does not know. Consequently it is not possible to judge how far it will fulfil the whole duty of howitzers in field operations. All that can be done is to estimate to the full what may be required of a howitzer in the field, and leave the future to decide whether the new howitzer alone will be equal to the task, or whether something more powerful is called for in addition.

The fog which obscures the performance of heavy guns in Manchuria hangs equally heavily over the history of the howitzers. We know from the press, and from published accounts of the war, that there were 6 inch howitzers before Port Arthur, and that when the place fell they trekked North.. Then all trace of them (at least so far as published accounts are concerned) is lost. Presumably they were among the 170 heavy guns referred to bv Von Donat as taking part on the Japanese side in the battle of Mukden. Of what they did and how they did it, or of what they were unable to do no word (to the writer's knowledge) has been published to the world at large.

It has been shown that we require heavy guns with a long range and deep dangerous zone. These requirements necessitate a high velocity and a flat trajectory. But a flat trajectory inflicts certain disabilities. These are:—

(i). Want of searching effect when engaging with frontal fire troops behind cover.

(ii). Inability to fire safely over the heads of friendly troops up to the last moment of the assault.

(iii). Lack of effect against overhead cover.

In all these cases a steep angle of descent is needed.

Indeed one authority, and he no mean one, has gone so far as to declare that for a quick-firing field gun a flat trajectory is a positive disadvantage.[2] Yet, although he is alive to the fact that this weapon does not fulfil all the demands of the battlefield, he does not suggest that it should forfeit the advantages which a long range and a flat trajectory confer, under the conditions proper to the employment of Field Artillery, for the sake of acquiring the virtues in which it is deficient. Obviously high velocity quick-firing field guns cannot be dispensed with. They are required for dealing with targets in the open if for nothing else. Neither can the long range heavy guns, which we have shown to be desirable, afford to give up their high velocity and flat trajectory. They will want them both for enfilade fire against infantry behind cover and Artillery behind shields. But

[1] The latest Japanese regulations lay stress on the fact that common shell is the best projectile against troops under substantial cover, or material. The bursting charge would of course be of high explosive.

[2] Rouquerol.—"The tactical employment of quick-firing field artillery." Translated by Captain Radcliffe.

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it may not always be possible to bring an effective enfilade fire to bear, or it may be desirable to add an effective frontal fire to it. This is where the howitzer comes in, and the French, by their adoption of the Rimailho howitzer, of 6 inch calibre for the field army, have shown their appreciation of the fact. But to answer the question whether howitzers of greater calibre than those of our Field Artillery will be useful demands a knowledge of what the calibre and other properties of our new field howitzer will be. The 5 inch howitzer is notoriously less powerful than a field howitzer might be, and it would be waste of time to take it into account.

What will be required in a howitzer are long range and great shell power. Long range in order to command a wide area without the necessity of changing position, and to search out supports and reserves in rear of the adversary's firing line and prevent their convenient distribution to threatened points. Great shell power for the attack of overhead cover with high explosive shell, and for destroying personnel behind cover and shields with shrapnel. A range of about 7,000 to 8,000 yards and a shell of some 80 to 100 lb. weight seem to be desirable for these purposes, judging from the circumstances of the battlefield which have already been discussed. A shorter range or lighter shell would probably on occasion fall short of our needs. If the new field howitzer fulfils these demands, well and good. If not, we should be prepared with something better in addition.

Mobility.

Now to consider whether guns and howitzers of the power indicated can be endowed with sufficient mobility for work in the field. In this connection we must hark back to the conclusions which ended Part II., and apply some of those which have not yet been utilized. Endeavour has been made to show that battles will be of long duration, that intervals between battles will be considerable, that movement on the field of battle by daylight will be less frequent than formerly, that advances and changes of position by night will be more general, and that main operations must follow a railway system. All these conditions go to facilitate the employment of heavy guns and howitzers in the field.

The long duration of battles will afford time for bringing up Heavy Artillery, even if its mobility is insufficient to permit of its keeping pace on the march with the troops with which it is to cooperate. These latter will be checked on entering the zone of fire, and will probably themselves be condemned to days of comparative immobility, during which it should not be difficult to bring the heavy guns and howitzers on to the field, even if the opening of the engagement found them several marches in rear.

The long intervals between battles will allow opportunities for improving roads, constructing bridges and approaches, and otherwise facilitating the transit of heavy guns over difficult ground.

The practice of utilizing the night for advances and changes of position which would be dangerous by day will put the less mobile guns on more of an equality with the lighter Artillery. Their necessarily slow pace will be of little or no disadvantage to them in such

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circumstances, provided that they can cover the short distances involved within the hours of darkness.

The propinquity of a railway will render possible the transport of powerful ordnance by rail to within a short distance of the battlefield, and will lessen the difficulties attending their ammunition supply.

It may be added that motor traction is becoming every day more practicable in military operations, and if adopted will greatly simplify the supply of ammunition to heavy guns and howitzers, and perhaps the transport of the armament itself.

The above arguments tend to show the possibility of using Artillery of great power in the more important phases of field operations although its mobility may fall far short of the standard by which Field Artillery is judged. But it does not follow that we should be content with such limited mobility as this implies. There will be conflicts on a less scale than that of the pitched battles to which reference has been made. To deny ourselves the use in these of the heavier guns, by failing to endow them with a mobility which it is within our power to provide, would be a wilful neglect of opportunity, and might place us at a great disadvantage with an opponent who had shown, as our continental neighbours appear likely to do, greater enterprize in this respect.

In the opinion of the writer, therefore, the question of whether guns and howitzers of greater calibre than those of our Field Artillery can co-operate usefully in field operations can be unhesitatingly answered in the affirmative as regards the guns, and provisionally in the affirmative as regards the howitzers, it being understood that in the latter case the addition of howitzers of greater calibre than the new field howitzer is dependent on the relation which its power bears to that which has been approximately indicated as desirable.

The further question of the extent to which they can co-operate belongs to the domains of tactics, to which the next Part of the essay is devoted. It is sufficient to remark here that in view of the influence which the conformation of the theatre of war must have on their employment, as pointed out later, it is not desirable to attempt to fix any proportion in which they should be provided. A decision on this point must be made as the result of study, in each case, of the ground on which battles are to be fought.

Also it would be trespassing beyond the scope of this essay to discuss in detail the calibres and weights which are required, nor could the discussion, if thorough enough to be useful, be kept within any approach to the limits allowed. If principles be accepted it is for experts to deal with these details. It may be remarked, however, that in the 60-pr., with its range of 10,400 yards with common shell and 9,500 with shrapnel we appear to have as good a gun as we require, while the 6 inch howitzer, if not ideally suitable, has a good deal to recommend it from the point of view of range and power. As to mobility, it has never been given a chance, and with a carriage of improved design might appear in a much more favourable light than it does at present. It goes without saying that howitzers for use in field operations must be able to dispense with platforms.

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There is one more point to which reference should be made, the capability of rapid fire on occasion. All writers on war have pointed out more or less clearly that it is not so much the extent of loss inflicted which shakes the *moral* of troops as the rapidity with which it is inflicted.[1] This is no new maxim, but the magazine rifle and the quick-firing gun have brought it into greater prominence, and improvements in material have made it less difficult to obey. We should be content with no weapons that are not as nearly " quick-firing " as science can make them, not because it will often be necessary to press them to a great rate of fire, but because the power to do so on occasion might conceivably win a battle and even end a war.

PART IV.

Tactics.

General Remarks.

It will be apparent from what has already been said that the functions of heavy guns and howitzers do not differ in principle from those of Field Artillery generally. They are in fact merely Field Artillery of a particularly powerful type, destined for special application. It follows that the tactical rules for their employment must be grounded on the same foundations as are those for Field Artillery. This inference is borne out by the manner in which the subject is treated in our training manual, where precepts are laid down applicable to all Artillery in the field, the action of field howitzers or Heavy Artillery being specially referred to only when supplementary observations appear to be required. We are, therefore, relieved from the necessity of treating the subject of tactics at great length, and the remarks which follow are intended more as a commentary on existing rules than as a full text.

It may be as well at this point to premise that when we speak of tactical " rules " it is not intended to signify that hard and fast laws can ever be framed to provide for all situations, but rather that certain precepts are more or less generally applicable, and should not be disregarded without good reason. In all questions of tactics the conformation of the ground has a predominating influence. Dispositions suitable on one terrain may be the reverse on another, although in other respects the situation may be unchanged. It is impossible to keep this fact too constantly in mind, whether in study or in the field.[2]

The selection of positions for heavy guns and howitzers is a matter of the very deepest importance, and will vitally affect their usefulness when engaged. Once committed to action their limited mobility may render it difficult to extricate them in daylight, should the need arise for their employment elsewhere. This difficulty will be the more severely felt as the action develops. It will, therefore, usually be advisable to retain them in reserve, or (if the expression

[1] Compare Prince Kraft—"Letters on Artillery." May—"Achievements of Field Artillery." Rogerol.—" The tactical employment of quick-firing field artillery."

[2] See the eloquent passage in which the influence of ground is referred to in Henderson's "Tactics of the three arms combined." The writer is not aware of any other treatise on tactics in which the matter is so emphatically dealt with.

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is preferred) "in observation," until the progress of affairs has to some extent indicated the dispositions of the enemy, and the positions which can be with safety assigned to them, and from which their fire can have full effect. The weight of their ammunition, moreover, exercises a limiting influence on the amount of it which can be carried within reach of the field of battle, and it is therefore essential that none shall be dissipated in tentative efforts, but that every round shall be made to tell.

The problem of whether employment should be by sections, batteries, or even groups of batteries, is one which the situation alone can solve. Considering the relatively small numbers of heavy guns likely to be found with a field army in the immediate future, and the fact that several objectives may call for their attention in a wide front at the same time, or that converging fire on the same objective may offer the best hope of effect, it seems reasonable to anticipate that dispersion by sections, or at all events by batteries, will lead to the best results.

Position on the march.

The position of heavy guns on the line of march must depend on the nature of the country and on the situation, and might be anywhere from one end of the column to the other. To take three typical instances:—

In a region of bold features—rugged eminences with wide plains between—when opposition is unlikely to be stubborn, but much annoyance can be caused by a few of the opponent's troops well posted, and when it is less desirable to inflict defeat than to avoid delaying the progress of our own troops, some heavy guns should march well to the front of the column, or even with the advanced guard, in order to deal early with any impediment that may be offered, and avoid the necessity for deployment. Circumstances of the kind referred to above were of common occurrence in South Africa.

On the other hand a force retreating in open country, where long ranges are offered, and movement is easy, will do well to attach some heavy guns to its rear guard for the sake of compelling the enemy to deploy at considerable distances, and so retarding him. Unless, however, movement across country is easy, or good tracks numerous, great caution will be required in this case to prevent guns being cut off.

Again in enclosed country, thickly wooded and flat, especially if opposed to an enemy well provided with cavalry, mounted infantry or cyclists, numerous and dashing enough to attempt enterprizes against the flank or rear of the column, the long range of heavy guns will be of no avail, and they themselves will be an encumbrance. The best place for them, if necessarily present in such a case, will probably be somewhere near the centre of the column, where their safety will be secured by the immediate presence of other troops.

What has been said in the foregoing paragraphs with regard to guns is equally applicable to howitzers should they be present, and should their mobility be sufficient to allow of similar uses for them to those proposed in the first and second instances.

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In attack

As has already been indicated the chief object of the heavy gun or howitzer in attack is to act as an antidote to the use of entrenchments and shielded Field Artillery by the defenders. In order that they may completely fulfil this function it has been shown that, as regards the guns, it is necessary that they shall occupy positions from which they can enfilade portions of the enemy's position or bring an oblique fire to bear on shielded Artillery. If their fire can be converged on an important objective, or combined with frontal fire from lighter guns, so much the worse for the defender, who should suffer severely both actually and morally.

As to the howitzers, their duties require them to be placed so as to be capable of attacking head cover, if necessary, with common shell, and of subjecting entrenched infantry or shielded Artillery to a shrapnel fire at angles of descent which will discount the value of any vertical protection. They must, moreover, be able to continue this shrapnel fire up to the last moment of the assault.

It is evident from the foregoing that any plan of attack must ensure that co-operation between Artillery and infantry of the kind referred to is fully possible, and with this object it will be necessary not only so to place the Artillery that it can afford the infantry full assistance, but also to select as special points of attack for the infantry, those parts of the position which offer the best opportunities for Artillery; for instance where trenches protruding in a salient from the general line facilitate enfilade fire.

When actual contact between attacking and defending infantry takes place, both guns and howitzers will be called upon to search the defender's position in rear of the fighting line, so as to hinder the movement of reserves. If the assault is successful they must endeavour to make the defender's retirement as costly as possible; if it is unsuccessful they must renew their fire to prevent the launching of an effective counter attack.

As a very careful choice of positions will be required to attain these objects, and as any important battle may be expected to be of several days' duration, any precipitancy in committing heavy guns and howitzers to the fight is to be deprecated. A very thorough understanding of the tactical situation on the part of their commander will be a *sine qua non* for success; he must have his finger, as it were, on the pulse of the attacking infantry, and be prepared to co-operate with them to the full. Previous mutual arrangements, as complete as possible, will be of advantage; but in default of them he must be prepared to act on his own responsibility. The next war will probably see a greatly increased use of telephonic communication, and in a system of this kind, if devised on comprehensive but simple and practical lines, will lie great possibilities for the combined action of Artillery and infantry, and for the control of the former, however much dispersed, towards a single end.

By the help, moreover, of telephonic communication the difficulty of observation at long ranges will be diminished, since it will be

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possible to post observers at great distances from the guns, but comparatively near to the target, and, especially in the case of those guns whose line of fire makes an acute angle with the front, well to one side of the line of fire, and thus in a better position for observation.

In defence

We have seen that the tendency of modern defensive tactics is to occupy certain points along a wide front rather than to maintain a continuous line.

The long range of modern firearms allows the intervening ground to be effectively covered with fire, and troops endeavouring to penetrate through the unoccupied spaces without due preparation would be exposed to enfilade fire, or, if they turned to attack any section of the position, to fire in reverse from adjacent sections. If the points for occupation are selected with discretion, their defenders will be able to support each other, and to bring a converging fire to bear on the ground in front of any part of the position on which the attack may be particularly pressed. Here again, apart from any demand which may arise on account of the possession of Heavy Artillery by the attacker, weapons of long range may be specially useful. The longer their range the greater the number of guns which can effectively cover any given part of the front, and consequently the greater the volume of fire to which the troops attacking that part will be exposed. But no assailant will dare to push in to effective ranges until he has ascertained, or thinks he has ascertained the dispositions of the defender, and particularly of his Artillery. The opening phase of the attack will, therefore, as all modern authorities agree, be confined to attempts on the part of the attack, by reconnoitring movements of his infantry, or by challenging the defender, as it were, with Artillery fire, to induce him to disclose his Artillery positions. Sooner or later the defender's Artillery must open, unless he is content to allow his assailants to establish themselves with comparatively little loss, and in a relatively short space of time, within effective range of the defences.

The opening of fire by the Artillery of the defence will immediately attract to it the attention of the attacking Artillery, and this in its turn will offer a target to the defender's Artillery.

The long range guns of the defence, if they are to be available for converging and enfilade fire in the later stages of the battle, must not allow themselves to be overpowered. They must if necessary, be withdrawn from this danger, but only with the object of effective co-operation later, when the plan of their opponent becomes more apparent. It will , therefore, be advisable to construct alternative emplacements for them before the action commences, with a view to their use in the later stages to bring fire to bear in any direction in which it may be required.

The need for heavy howitzers in defence is not so great as in attack, since there will not be, at all events to the same extent, cover to be destroyed with common shell, or to be rendered ineffective by shrapnel with steep angles of descent. Their assistance will probably be chiefly limited to the attack of shielded Artillery, and to searching

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deep folds in the ground where supports and reservs may lie concealed. Indeed were an army to contemplate purely defensive action it would probably not be worth while to bring heavy howitzers into the field. Such a design, however, can never form the whole programme of a commander who desires to be victorious in war.

PART V.—*Summary.*

The following summary will, it is hoped, aid the reader to follow the arguments and conclusions of the writer, and perhaps clear up points which have not been made sufficiently intelligible:—

(i). Power is of supreme importance for Artillery and has always been sought after.

(ii). The employment of Artillery of great power is and has always been limited by its mobility, i.e. by the possibility of bringing it into action when and where required.

(iii). This possibility is governed by the nature of Artillery equipment and by the varied conditions under which it may be required to act.

(iv). Equipment improves, and the conditions under which it may be required to act, in other words tactics, develop along with the development of armament and appliances.

(v). Artillery is the servant of the other arms. We must, therefore, examine the tactics of infantry if we wish to comprehend the conditions under which Heavy Artillery will be required to act.

(vi). An examination of such tactics reveals that at the present day marked developments have taken place; that entrenchments will be more largely used; that battles will be of longer duration than formerly and waged over a wider front; that movement on the field by daylight will be more difficult; that the intervals between battles will be longer, and that main operations must follow railways.

(vii). These developments render more possible the employment of Artillery of greater power than our Field Artillery, and greatly enhance its value in the field.

(viii). Improvements in Artillery equipment also render more possible its employment.

(ix). Artillery of greater power than our Field Artillery can, therefore, co-operate usefully in field operations.

(x). The extent to which it can co-operate varies with the ground, with the circumstances of its employment, and according to whether guns or howitzers are under consideration.

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A Reply to Major Burney's Criticism.

By CAPTAIN C. C. NOOTT, R.G.A.

IN the R.A. Journal for May there appeared a short criticism by Major Burney on a previous article of mine in the R.A. Journal for December, 1906; and as this criticism appears to be based on a slight misreading of the article in question I should like to point it out, as briefly as possible.

In Major Burney's example the director is laid at zero on the *aiming point*, and the angle to the target is then measured and put on the sight, with the result that the gun is laid 60° wrong.

But in the original article it was stated that "the director should always be laid at zero on the *target*." Were this done, in the example given, the angle to the aiming point would be 30° instead of 330°, and if this were put on the gun sight the desired result would be obtained quite correctly. It would, however, be advisable to reverse the telescope in its bearings.

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"DUNCAN" SILVER MEDAL ESSAY, 1907.

"To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations, and what rules should govern their tactical employment?"

By CAPTAIN W. H. MOORE, D.S.O., R.G.A.

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INTRODUCTORY.

The subject forming the heading of this paper is treated in two parts. Part I. discusses the extent of the useful co-operation, Part II., the rules which should govern their tactical employment in field operations. The expression "guns" is used throughout, except at times when it is desired to lay stress on the uses of the howitzer; similarly "long range fire" implies fire at all ranges beyond that at which Field Artillery shrapnel is effective.

At the conclusion of each Part are summarised the deductions, which the author has drawn from his arguments.

PART I.

Questions to be answered before the extent of the co-operation can be determined:—

In the consideration of the extent to which guns and howitzers of greater calibre than those of our Field Artillery may usefully co-operate with them in field operations, it is necessary to investigate the general question of the rôle of Artillery, and to draw the deductions which appear applicable in the light of the most recent experiences of war under modern conditions.

The rôle of the Artillery, from its infancy to the present day, has remained unchanged—to support the other arms in attack and defence. The questions now to be answered are the following:—

Have modern conditions limited the support available from Field Artillery proper? If they have done this, how far can this support be supplied by the co-operation of pieces of greater calibre? In what manner should this assistance be given, is it to be a direct support to the other arms, or is it to be an indirect support exerting

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its influence by permitting the lighter guns to perform their task?

It is unnecessary to trace in detail the causes which have produced the modifications which have raised these questions. Improved communications, facilitating supply, have increased the numerical strength of field armies; manufacturing improvements, the power and accuracy of the weapons; and concealment has been rendered possible by a smokeless propellent. The extended front, so marked a feature of recent battles, is due to a combination of these causes; the attention paid to concealment and construction of field fortifications is the natural sequence of the increased accuracy and deadliness of the armament.

Field fortifications:—

The employment of field fortifications on the battlefield is no new feature; but, in both the most recent campaigns between civilized armies, has developed to an extent before unknown in field operations. The effect of positions, for whose preparation sufficient time has been available, exercises, in addition to its considerable influence on the course of the campaign, one equally powerful on the question of the artillery armament of the field armies. Considerations must therefore, be given to them as regards the latter point.

In the attack it may be difficult to determine the precise moment at which field operations merge into siege. The Russo-Japanese war has proved that Field Artillery, even when provided with high explosive common shell, can produce little or no effect on good trenches, even when supported by heavy guns; thus confirming the experiences gained from common shell with powder charges and showing that a bombardment of defence works does not give a result commensurate with the ammunition expended. Consequently it may be assumed that bombardment of defence works is not within the province of Field Artillery or of any heavy gun with the field army.

The following definition may perhaps be accepted.

In field operations no bombardment, except under some special local circumstance, will be undertaken with a view to the actual demolition of the works, while in siege operations the destruction of the defence works is an essential preliminary to the assault. If this definition is allowed, the attack of carefully prepared positions becomes a problem, somewhat more complicated it is true, but still the problem presented by the attack on any position.

It is, however, apparent that fortifications of any sort will limit the effect of Field Artillery fire, since shrapnel will only be effective at the moment when the defenders are exposing themselves to fire. The field howitzer's range is too short, and, unless the conditions are favourable, it may be impossible to bring them up within effective ranges. The possibility of bringing enfilade fire to bear is remote, since a position which permits it would hardly be defended. The co-operation of heavier guns with longer ranges will be invaluable, as it may be possible for the heavier gun to employ enfilade fire at long range, and the heavy howitzer should certainly be able to approach within range of the trenches.

The special local circumstances, which do not cause the general

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principle, that works should not be attacked, to be infringed, are the presence of redoubts, in support of the infantry trenches, fortified houses and villages. The occupation of the latter is usually proof that they are sufficiently solidly built to be a protection against ordinary shrapnel or common shell. Heavy guns firing high explosive shell will be required for their attack should the field howitzer range prove insufficient.

In the attack on a redoubt, it is not as a rule necessary to demolish the parapet, if the interior of the work is well swept by high angle fire. The heavy gun should not, therefore, participate in the attack which devolves on the howitzer.

Duties of artillery in the attack:—

The duties of Artillery in attack are:—

(1). To bring fire to bear on the portions of the position from which effective fire is being directed on the advancing infantry, and on ground under cover, in which the enemy may collect to meet the assault.

(2). To engage the enemy's guns, which may be shielded and comparatively immune against shrapnel fire.

(3). To accompany turning movements.

(4). To be ready to meet counter attack.

(5). To hold at arm's length reconnaissances with which the other arms are unable to cope.

(6). By their moral effect to support the infantry.

Each of the above heads are treated in sequence.

Co-operation with the Infantry:—

(1). There are few, if any, positions affording so favourable a field of fire to its defenders as to prevent the Artillery of the attack finding sufficient cover to approach within effective range. As a result of the experiences of the Russo-Japanese war, we have learnt that " to bring guns into position or to *change* position under Artillery fire is to court disaster "; in other words, the most mobile of batteries may find itself immobile through stress of circumstances, and through no fault of its commander, unable to co-operate with the infantry advance. Long ranging guns, even if equally tied down to their position ought to be able to continue to co-operate, unless their original dispositions are very faulty.

To prevent the massing of reserves under cover, behind a threatened section, is a task beyond the capacity of a flat trajectoried gun, and will often be impossible for the short ranging field howitzer, though within the power of the howitzer of larger calibre.

As the infantry close in on the trenches during the assault heavy guns will be able to continue the fire with lyddite after Field Artillery shrapnel fire has become dangerous.

Engaging guns:—

(2). Since " superiority of fire can rarely, if ever, be attained " and further, since the guns of the defence will often be in concealed positions, the Artillery duel as a separate phase of the action is no

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longer to be expected. The courses open to the Artillery of the defence are:—

(a) To force deployment by long range fire.
(b) To confine its attention principally to the advancing infantry.
(c) To engage the enemy's guns when located, or to seek them out, if bringing an effective fire on the position.

Should the first of these three courses be followed, it is probable that heavy guns will be employed, in which event the assailant will require heavy guns to reply to the fire.

In the two latter, the co-operation of heavy guns is not essential in replying to the fire, unless the enemy's guns are shielded, in which case it may become necessary to engage them with high explosive shell. Though not essential, heavy batteries can still usefully co-operate, especially if it is possible to locate them, in some position from which a view of the hostile guns can be obtained.

Turning movements:—

(3). To accompany a turning movement is a task that must be principally be allotted to Field Artillery, owing to its superior mobility. Yet, as every flank attack is necessarily frontal at the point of contact, a proportion of heavy guns should accompany the movement; the more so, as opportunity will probably be found to bring enfilade fire on the main line of defence.

Counter attacks:—

(4). No special point with reference to the subject of this paper requires notice, the greater range of heavy guns obviously allows a greater " sphere of influence."

Reconnaissances:—

(5). The necessity of holding reconnaissances at arm's length has hitherto hardly been considered with reference to " attack," this subject being usually treated under the head of " defence." The employment of guns against reconnaissances, as at present composed, is rightly condemned. Will, however, the present methods of reconnaissance remain those of the future?

Balloons have been employed for many years for purposes of observation, but their usefulness has been restricted by immobility. The progress made in aerial navigation has now reached a point that merits serious attention. In December, 1906, two French Officers accompanied by three men went over a prearranged course of over thirty miles in a dirigeable balloon. Without the confidential details, the true value of this experiment can not be gauged; it is sufficient to show that a plan for dealing with such a method of reconnaissance ought to be thought out. So long as buoyancy is provided by gas enclosed in a fragile envelope, Field Artillery shrapnel fire is sufficient if they approach within range. The advisiblity of opening fire with heavy gun shrapnel on a dirigeable which attempts to reconnoitre the dispositions out of field gun range needs to be considered. The actual decision depends on the circumstances of each individual case, and should remain in the hands of the highest authority present.

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Moral effect:—

(6). The preceding paragraphs have dealt with the material effect of the Artillery support, there still remains the moral effect, the importance of which can hardly be exaggerated. It is an axiom that the fire of their own Artillery has an encouraging effect on advancing infantry; a fact which has frequently led to what would otherwise have been a useless expenditure of ammunition. The increase of confidence given by the presence of heavy guns is undoubted; and if the enemy possess heavy guns which outrange their own Field Artillery, a feeling of depression and impotence will arise. The employment of heavy guns in the latter case becomes necessary to enhance morale.

Artillery in defence:—

The duties of Artillery in defence are variations of those required from it in attack, and with the exception of two points hardly require special comment. The two points which it is desired to touch on are:—

(1) To delay the attack by forcing an early deployment.
(2) To cover the retirement from the rallying position.

Fire brought to bear to cause early deployment:—

(1). The first of these has already been mentioned, and has been hitherto regarded perhaps as an expedient more suited for a passive than active defence. Such an idea can no longer hold good; it is inevitable that, even in the most active, at some points it may be desirable to delay attack, and that the extreme range of the guns will be utilized to gain time; as, for example, in meeting a turning or enveloping movement. Long ranging heavy guns will be useful on these occasions to supplement the field guns.

Guns for the " rallying position."

(2). In covering the retirement from the rallying position, the topography of the country will be the deciding factor, as to the nature of the guns to be employed, after the movement has commenced and the main position evacuated. The more mobile the guns the better, since the troops occupying the position will ultimately form the rear guard. Until the main position has been abandoned, the guns sent back to it will be unable to co-operate in the action unless they have long range, since " the rallying position should never be so close to the battle position that the troops occupying it would come at once under effective fire." Every field battery sent back is lost to the action, and that at a time when it is most needed; a heavy battery, detached to it, will in favourable circumstances still be able to take part in the action, its withdrawal, unless posted further to the front than is likely, will be unnoticed and the loss of morale to the troops in action avoided.

Remaining operations in which guns co-operate;—

With advanced and rear guards and in the outpost line, the co-operation of heavy guns can only occasionally be necessary, while in

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the pursuit of a beaten enemy this co-operation may bring decisive results, should a bridge or defile lie on the enemy's direct line of retreat.

Conclusion:—

From the arguments brought forward, the following answers are given to the questions at the commencement of this Chapter.

Modern conditions have limited the support available from Field Artillery proper. This support can, in a large measure, be supplied by heavy guns and howitzers treated as heavy Field Artillery, and should be given by their co-operation with the Field Artillery. The aim and extent of co-operation being:—

(1) To assist in enhancing morale.
(2) To engage the enemy's heavy batteries and shielded guns, and to assist in the attack on his field guns.
(3) To enfilade and search ground beyond the effective ranges of field guns, and to unite with them in the preparation of the assault.
(4) In certain special cases to actually demolish parts of the enemy's defences.

PART II.

The principles and objects in view from which are deduced the rules that should govern the tactical employment of heavy guns and howitzers are treated in the following order:—

(1). Position in the order of march.
(2). Splitting up the batteries.
(3). Control and opening of fire.
(4). Intercommunications.
(5). Targets justifying expenditure of ammunition.
(6). Distribution and positions on the battlefield.
(7). Guns told off for turning movements and counterstrokes.
(8). Guns for the rallying position.

Position in the order of march:—

In the discussion of the extent to which heavy batteries can usefully co-operate with Field Artillery, the view has been taken that they are required to supplement and not in any way to act as a substitute. It follows that, in the preliminary stages of the action, they are not required unless the enemy by long range fire attempts to force early deployment. The position of the batteries in the column of march is thus determined; they should have a sufficiently forward position to be able to reply without delay, and yet, so far as possible be kept behind the troops who will first enter into action.

In open country they must be placed relatively nearer the head of the column than in one more enclosed. With a division formed of three brigades, their normal position may be assumed to be in rear of the second brigade, while in open country it would be advantageous to move them up behind the leading brigade.

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Splitting up of batteries:—

With the Field Artillery it is a principle that the sections of a battery should not be separated in action, as the efficiency of its fire suffers diminution. On the other hand, Field Artillery Training, 1906, suggests the dispersion of Heavy Batteries by sections while the provisional Heavy Artillery Training of 1904, went a step further in stating the employment of heavy guns singly to be permissible. The arguments for and against splitting up batteries are so well known that repetition is unnecessary; they apply equally to the sub-division of field batteries which, as already stated, is a violation of accepted principles. The limited number of heavy guns, in comparison to field guns, which it is possible to employ in any campaign, renders, however, a dispersion by sections inevitable to increase the area under their fire and to gain the advantages of cross fire. The employment of single guns has been justified in practice; yet the loss of control and fire effect in addition to the increased expenditure of ammunition, in ranging, seems to show that this method should only be resorted to exceptionally and not considered in any way a normal procedure.

Control and opening of fire:—

It is laid down that "Control by the higher Artillery Commanders should be maintained as long as possible, provided the duty of acting on their own initiative, according to the changing circumstances of the fight, is not thereby lost sight of by their subordinates." This paragraph applies with even greater force to the control over heavy batteries; as, after they have once opened fire, there will no longer be the possibility of their employment at any point coming as a surprise, which it is most desirable should be the case. The premature action of the Japanese heavy guns on the day preceding the passage of the Yalu is an excellent illustration. Had the Russians wished, they could have retired their Field Artillery, which, sheltered from their opponents' gun fire, would still have been able to effectively shell the infantry crossing.

Surprise is a powerful factor, and a surprise caused the unmasking of an unexpected heavy battery is not its least effective form. Quoting once more from Field Artillery Training.—" Fire should not be opened with more guns than are necessary to accomplish the task in hand." In other words, the number of guns available is not to be disclosed until it becomes absolutely necessary. A deduction can be drawn that heavy artillery must reserve its fire as long as possible, that is until called on to assist the lighter guns.

A very effective system of control is necessary to prevent either a premature opening of fire or delay in doing so when it is required. Control, at any time difficult, becomes practically impossible if the command is much sub-divided, unless a good system of communications is established, and very often even then. The responsibility for opening fire devolves, in nine cases out of ten, on some junior officer who has to decide the correct moment.

The best method to minimize the chance of premature action or

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hesitation is the issue of " special instructions " *in writing*, based on the situation and intentions of the G.O.C. Any deviation from their spirit being sternly repressed, unless justified by the unforeseen circumstances provided for in the first chapter of Combined Training.

Inter-communication:—

A system of inter-communication should be established at the first opportunity, and could be arranged by visual signalling or by telephones. The Japanese system of field telephones appears to have given excellent results, but to carry out this system requires a large number of trained specialists.

In the organization of a Division recently published, a place has been found for one telegraph company, Royal Engineers. The new " War Establishments " are not yet available, so it is impossible to say whether laying telephone lines in action forms part of their duty or not; in any case the personnel and materiel of this company can be made available if such a step is considered advisable by the divisional commander. For the instruments, communicating between sections of heavy batteries and with the Heavy Artillery Commander in a large force, the batteries themselves should be trusted to find operators, as it is objectionable, from every point of view, that men of another corps should be utilized in the Artillery chain of information and command.

It is desirable to open communications between:—

(1) The separate sections of Heavy Batteries.
(2) The Heavy and Field Batteries.
(3) The Artillery Commander and the Heavy Batteries.
(4) The Heavy Batteries and the Infantry.

It may frequently prove impracticable to arrange them all. Endeavour must be made to at least establish the first two.

Stress has previously been laid on the control to be exercised by the Higher Artillery Commander, it would appear at first sight that a want of consistency is shown. Is this the case? Without a system of inter-communication, it is impossible for the heavy guns to efficiently support the Field batteries; the necessity that this should be done, has been already fully brought out in Part I. of this paper. There is nothing to prevent his position coinciding with one of the communicating stations; and even should there be a reason against this, he can indirectly maintain his control by issuing the " Special Instructions " recommended. Again, it may be assumed that the Field Artillery will endeavour to open communications with the Infantry, the information received from them can be passed on. Thus the four lines of communication, stated to be desirable, can be fairly replaced by two; though it is maintained that it is better to have the full system recommended.

The following plan is suggested where flag or semaphore signalling is employed.

The sections of heavy guns to communicate, either directly or through adjacent sections with a central point situated apart from any gun position to avoid possibility of destruction. This point will be the station of the C.R.G.A. of a large force, or the C.R.A. of a small

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one, it will also be in direct communication with brigades of Field Artillery and Infantry. All information, likely to be useful, will be sent to this point and dealt with by the officer responsible for fire control, who will either transmit it for information, or on it base his orders.

Where telephones are used, the central point will require sufficient instruments to prevent congestion of the messages.

Targets:—

The targets common to heavy guns and howitzers which justify the expenditure of ammunition are:—

(1) Special localities from which effective fire is being delivered, whether within or without field gun range.

(2) The enemy's batteries, with these limitations that it is desirable only to engage heavy guns when their fire is effective, and field guns after their positions have been located. Unless the troops are well broken in to war, it will generally be found that heavy guns must be engaged, on account of their moral effect, even though causing no appreciable loss.

A target special for heavy guns is given by bodies of troops in the open, beyond field gun ranges; and for the heavy howitzers by positions under cover in which the enemy may mass; these positions may be invisible to the howitzers, but allow of fire by map bearings if observation stations can be found. The consideration of the targets allows the deduction as to the projectiles which are best suited to gain the desired object. A discussion of the point appears outside the scope of this paper and has been avoided, a statement alone being made. For heavy guns shrapnel, and for howitzer lyddite should be considered the normal projectile.

Effect is to be striven for by short rapid series rather than by prolonged efforts, as otherwise the critical moment may find the heavy pieces short of ammunition. A considerable expenditure is notwithstanding inevitable, especially from the howitzers if it is necessary to fire on batteries in concealed positions, requiring to be searched. It is to restrict this expenditure that the limitations have been suggested in engaging batteries.

Distribution and positions:—

Their distribution and positions must largely depend on the nature of the ground and the frontage allotted to the organization of which they form part. It is undesirable to remove to other parts of the line batteries thus detailed, though this procedure will often be justified.

In the latest scheme a heavy gun battery is an integral part of a Division; no mention is made of heavy howitzer batteries, which, when employed, will no doubt come into the category of Army Troops, and be available for service at any point of the front.

The difference in character of the co-operation expected from guns and howitzers roughly indicates both the distribution and positions to be assumed. The normal projectile of the former is shrapnel, and in addition to engaging guns they may be called on to attack

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infantry at long ranges. To carry out these tasks to the greatest advantage, positions from which wide arcs of fire can be obtained are required. The howitzer, on the other hand, should be entirely confined to stationary targets; its arc of fire is not restricted by the topographical features in the same way as that of a gun, consequently, provided that observation stations can be found, its power is not seriously diminished in an enclosed or hilly country. The sections of heavy guns should, therefore, be placed in positions from which advantage can be taken of their long range fire, while those of the howitzer battery should be located, so as to cover ground to the front or flank inaccessible to guns or field howitzers.

In both attack and defence a proportion of heavy guns should be placed on the flanks to delay turning movements or counter-attacks of a similar nature; howitzers, owing to their more deliberate rate of fire, being only employed when ground inaccessible to gun fire constitutes a danger.

Heavy batteries will often be posted in positions some little distance in rear of the main defensive line. It is not advocated that the usual position should be far behind, as was often the case with the Boer heavy guns. Yet, when suitable positions exist close at hand, there appears small advantage to be gained in pushing up guns, whose comparative immobility might render their retirement a matter of difficulty. The principles on which positions are occupied or preparations made for their occupation are practically the same as for Field Artillery. It is not proposed to enter into an argument as to the merits or demerits of covered positions and indirect fire. Heavy guns are less likely to have rapid changes of target, for them the arguments against the assumption of covered positions have not the same weight, while those in its favour are strengthened. No hard and fast rule can be laid down, the officer in command at the time will will decide which method he must follow; yet the advantage of a covered position are such that powerful local objections must exist to outweigh them. Heavy howitzers, not having to engage moving targets, should even more rarely be in any but a covered position.

Turning movements:—

Heavy guns should invariably accompany the force detailed to make a turning movement to reply to those probably posted on the flank of the enemy's line, and to seize any opportunity of bringing enfilade fire to bear. Where the movement is commenced prior or simultaneously with the frontal attack or demonstration, no points are offered for consideration. The case in which the movement is to be initiated at a later stage requires notice, as it indirectly raises the question as to whether heavy guns may not occasionally be maintained in reserve with advantage.

The troops detailed to execute it will be taken from the reserve, or a special reserve formed for the purpose. Artillery rarely forms part of the reserve, the batteries required being withdrawn from the front. The mobility of field artillery allows this procedure to be followed without an undue strain on their teams. Heavy batteries, on the other hand, with a comparatively limited mobility, should be

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spared unnecessary movements. If no suitable position, in which they could remain in " observation " or " readiness," exists in the proximity of the " position of assembly" of the force, it seems advisable, except on the defensive to retain heavy guns temporarily in reserve.

Counter-attack:—

In the first stages of a counter-attack heavy guns will be called on to assist in preparing its way. After the attack has made some progress, a proportion of heavy guns ought to be pushed forward to accompany it, and take advantage of the possibilities of bringing an enfilade fire to bear on the main front of the attack. The number to be sent forward rests with the G.O.C.

The commander of the guns advanced should be held responsible for the dispositions of his escort, and bring to the notice of the proper authorities a failure to supply, or inadequacy of the escort detailed, as the guns will be to some extent exposed.

Rallying position:—

The advantage to be gained from the employment of heavy batteries at the " rallying position" have already been mentioned in Part I.; in which it was pointed out, that, since the troops sent to occupy it would ultimately form the rear guard, mobility was required from their guns. The heavy guns detailed to cover the evacuation of the position, must not for this reason in ordinary circumstances be retained after this operation has been successfully carried out, but follow the main body in its retirement being replaced by Field Artillery.

Conclusion:—

The view has been taken throughout this paper that the desired co-operation is best obtained by treating heavy guns and howitzers as Heavy Field Artillery. The consideration of their tactical employment has been directed to these points, in which modifications or deviations from the accepted principles of Field Artillery may seem advisable. If the arguments brought forward are accepted, it appears that, though occasionally the application takes a somewhat different form, the general principle remains intact.

This view and the arguments brought forward are taken as the basis on which the following rules, governing the tactical employment of guns and howitzers of greater calibre than those of our Field Artillery, are drawn up:—

(1). In the Order of March batteries will be placed nearer the head of the column in an open, than in an enclosed country.

(2). Batteries will usually operate by sections, since the number of guns available will be limited.

(3) Fire must not be opened till the conditions of the battle renders it obligatory, to ensure this an efficient system of control is necessary. The issue of " special instructions" *in writing* is advocated.

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(4). Communications should be opened up at once between the separated sections of heavy guns and between them and the Field Artillery; in addition, as soon as possible, with the Senior Artillery Commander and the Infantry.

(5). The distribution of heavy guns will be governed both by the allotment of the organization of which they form part and also by the nature of the country.

(6). The positions assumed and methods of occupation will conform to the present Field Artillery views, of which the three most important are:—

(a) Guns not in action should be held ready to enter it without delay, and kept in positions of " observation " and " readiness."

(b) When guns are within effective range, changes of position are to be avoided.

(c) Indirect fire has its advantages, but this method must not be overdone. With howitzers it will be the rule, but with guns only so long as rapid changes of target are not necessary.

(7). It is desirable that the targets to be engaged should have been previously located.

(8). The consideration of the probable targets has allowed the deduction that the tactical rôle of the heavy gun will be best carried out by the employment of long range shrapnel fire; while the howitzer will be confined to engaging guns and searching ground with high explosive shell.

(9). It is permissible for the assailant to temporarily maintain in reserve heavy batteries detailed to accompany any turning movements.

(10). Heavy batteries detailed to occupy the rallying position will, under ordinary circumstances, be replaced by Field Artillery after the evacuation of the position is terminated.

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*The Siege Operations at Langres August—September, 1906.**

By COLONEL H. C. C. D. SIMPSON, C.M.G., R.A

LANGRES in the Napoleonic days, was regarded as an important fortress, but since the conclusion of the Franco-Prussian War, it has sunk into insignificance as such, by the creation of Verdun, Toul, Epinal, and Belfort, as the important frontier fortresses. It is situated on a commanding plateau with a hard rocky surface. The main object of the Siege Operations was to test the following:—

1. The general functions of the Siege Artillery in the preparation for the attack of a fortress.
2. The installation of the principal and divisional parks.
3. The construction of the siege railways and their working in connection with the siege batteries.
4. The organization of the lines of communication.
5. The general duties of command of the different "echélons."
6. The effect of the fire of the different pieces against various forms of works. This exercise was, however, considerably hampered by the impossibility of opening fire from more than two batteries at the same time, without clearing the villages of their inhabitants, which was deemed impolitic.

The general idea was as follows. "An army based on the river Marne, North of Chaumont, receives orders to invest Langres and besiege it. This army is composed of four Army Corps. It has seized and repaired all the railway lines to the North and East of Langres. It advances on the 20th August, the Central Corps moving on the Marne Valley and the Plateau on the left bank. It is supported to the East by another Corps moving up the Rognon Valley, to the West by a Corps moving up the Valleys of the Aujon and Aube, and by the fourth Corps from the South. Two Siege Artillery Trains and two Engineer Siege Parks are attached to the army. Langres is placed on a war footing as regards garrison, rations, guns, &c., from the 1st August.

Three of the Corps, the Eastern, Western, and Southern, and one of the Siege Trains and Engineer Parks are imaginary. The Central Corps is represented by the following troops of the Field Army:—

* In the preparation of this paper my own experiences are supplemented by those of Foreign Writers.—*H.C.C.D.S.*

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12 Battalions of Infantry.
3 Squadrons of Cavalry.
2 Brigades Field Artillery.
2 Batteries Heavy Artillery.
4 Field companies Engineers.

and the following details making up one complete Siege Artillery Train and one Engineer Siege Park:—

42 Batteries Foot Artillery (including four railway batteries).

12 Siege companies of Engineers with material for Park. 2½ Telegraph companies and two balloon companies of Engineers. The whole force under General Dickherr. The Siege Train to work in a zone North of a line Rochetaillée, Voisines, Vieux-Moulin, Langres up to the Marne, the imaginary Train operating South of this zone.

The defending force under the Governor of Langres will consist of:—

12 Battalions Infantry.
1 Squadron Cavalry. } under General Ruffey.
3 Batteries Field Artillery.
4 Companies Engineers (including 1 for balloon, 1 for search lights and 1 for Telegraphs).
3 Batteries Foot Artillery.

On arrival, the troops of the attack will be encamped at Foulain and Villiers-sur-Suize, and those of the defence billetted in or encamped near Langres.

The employment of the infantry and cavalry on both sides was not considered of great importance in these operations, and was mainly introduced to give an air of reality to the Siege, and to mark the various phases of the Field operations which must take place prior to an investment, also to carry out the usual sorties of the defenders and assaults by the besiegers, &c. They were never permitted by General Pendezec, the Director of Manœuvres, to be pushed on to their logical conclusion, as it would have interfered with the carefully pre-arranged scheme, especially as the defenders, as it turned out, generally got the best of the field operations. I shall, therefore, not go into very great detail on their action, but concentrate my remarks mainly on the work of the technical Siege troops throughout the preliminary and actual operations. The scheme of defence was not taken very seriously, beyond the desirability of making the fortress a satisfactory butt for the Siege attack. This was largely done by marking out upon the ground the works which would really have been constructed in war. Nothing was absolutely laid down as to the number of Pieces or nature of the armament of the fortress, of the strength or composition of the force the Governor would actually have in war as his garrison, the amount of time likely to be required for the construction of the additional works, or the amount of light railway and rolling stock he would have at his disposal. In short his defence scheme and fort commander's books would appear not to have been completed to date! With a view to saving time and waste of work, he was told of the direction of attack, and that his works were merely to present an outward appearance of completeness to

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the enemy, especially to his balloon observers, and to be finished by the 30th August. The permanent defences on the side of Langres affected by the attack included the important forts of Saint Menge and la Pointe de Diamant, the Hume Battery and the Works of Virloup, Perrancey, Noidant, le Bonnelle, and Fays. With the exception of Saint Menge these defences extend along the slopes of the Plateau above the deep valley of La Mouche, which constitutes, as it were, the ditch of the whole of the position. In the rear of this principal line of defence, works were to be thrown up, trenches excavated, and a second line of defence arranged for above the ravine of le Bonnelle, a formidable ditch to cross, and above which rises the rocky promontory upon which is situated the town itself with its enceinte and citadel.

Situated at the head of the three valleys of the Meuse, the Marne, and the Saône, the fortress of Langres is a fairly formidable one, its weakness from a military point of view being an indifferent water supply in summer. Insufficient labour combined with the hardness of the surface, prevented the carrying out of the works of defence in anything like their entirety. A few batteries as well as the infantry trenches were finished. But the greater part of the former were simply indicated by stones without ditch in front or excavation in rear, or marked out by tapes. This insufficiency in the number of works of the defence, and the absence of light railways, deprived the fortress of the proper semblance of reality, and, therefore, of a large portion of its value in the operations, by minimizing the number of lessons to be learned on both sides, and so constituted a weak point in the scheme.

A sham line of advanced works to draw the besiegers' fire was constructed in front of the real line, and armed with obsolete guns or trunks of trees and fascines to resemble them mounted on dummy service carriages. But if trenches had been dug and siege railways constructed to connect them, it is probable that their true nature would have been detected by the enemy's Balloon Observers, from the absence of any sapping zig-zags to them from the rear, the construction of which would have required more time than was available for their excavation. The general opinion, therefore, was that they were a waste of time, and that on such a soil all the batteries should have been constructed with filled sandbags concealed by some vegetation and brushwood, of which plenty existed in the neighbourhood.

The works on the spur of Virloup had to be constructed with a view to their being actually shelled by the batteries of the attack, and consequently their position was not such as would have been taken up by the defence in war.

In the neighbourhood of Perrancey the works were revetted on their interior slopes with steel plates, which seemed unnecessary. Some of the infantry trenches were, however, well constructed with overhead cover giving thorough protection from rifle and shrapnel bullets, and in the angle of the salient of the infantry redoubts a machine gun was frequently seen in position, though I fear of obsolete pattern.

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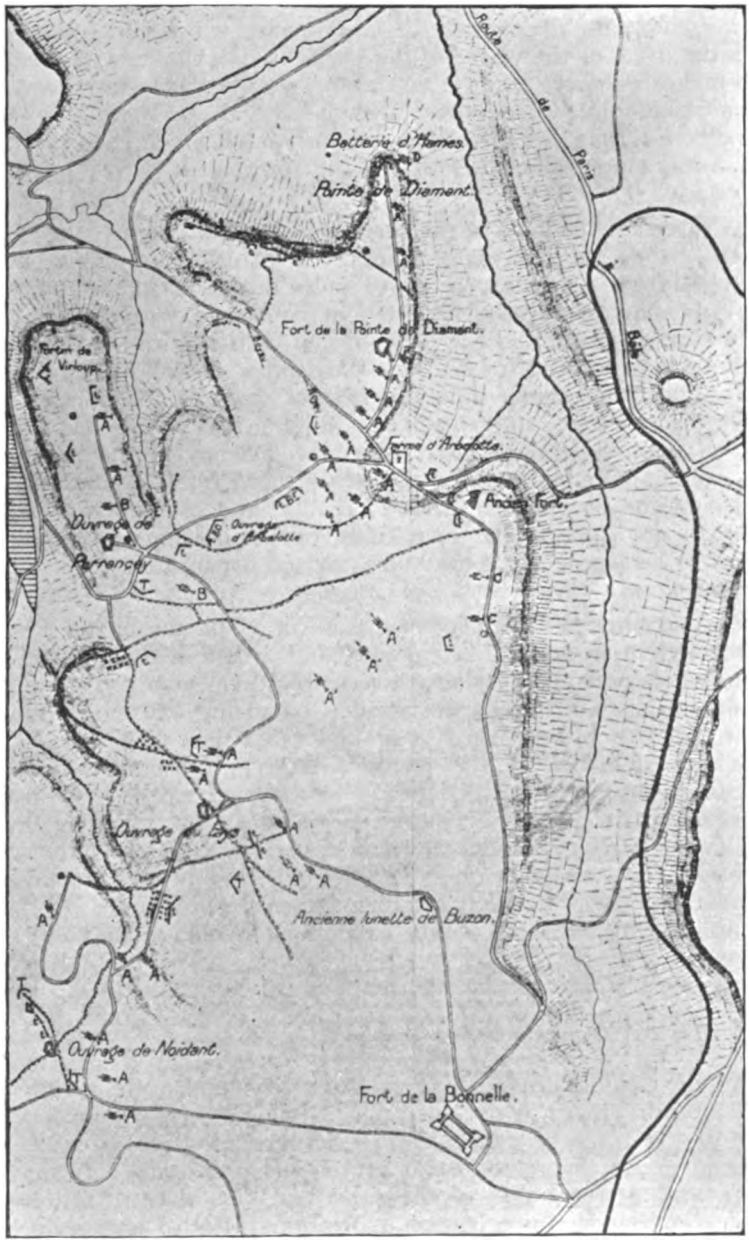
In the sketch of the Position of the Defence, the Sham Advanced Works are not indicated.

The armament in action of the forts (permanent), I believe, mainly consisted of 6·1″ guns in cupolas, in addition to those pieces alluded to as being in the temporary works, and 6 Pr. Q.F. guns.



Sketch of Defence Batteries.

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SIGNS IN THE SKETCH (DEFENCE).

T. denotes covered infantry shelter trench.
t. „ Infantry shelter trench without head cover.
A. „ a 4·7″ battery of 4 guns and "a" is an isolated 4·7″ gun.
B. „ battery of 4-6·1″ Howitzers, and "C" a battery of 4-5·45″ guns.
D. „ battery of 4-3·7″ guns, and " E," a battery of 4-3·5″ guns.
O. „ Observation of Fire station, xxx telephone lines.

According to General Nogi's views, the 1st line of defence works in future will have to be eight miles from the objective which is the kernel of the defence as it were. In this case they were barely 5,000 yards from the Citadel.

The troops and works were divided into three sections, of which No. 1 included the group of works of Le Fayôt between the Valleys of La Mouche and Le Bonnelle, No. II. the group of l'Arbelôtte between the Mouche Valley and the Paris-Belfort Road and No. III., the section at Jorquenay under General Cornille, the Governor, personally. The works and batteries were considered completed and ready for opening fire on 27th August. An electric light projector was installed near the Perrançey earthwork, which lit up the side of Vieux Moulin and adjacent positions, and another at Fort Saint-Menge, which lit up the Valley of la Mouche up to Saint Ciergues. They both appeared much exposed. On the Arbelotte Plateau, near Fort la Pointe de Diamant, a balloon was stationed, which made its ascents up to 1,600 feet. A description of the balloon arrangements of the defence are worth considering here, as they were more efficient than those for the balloons of the investing force, which had two at its disposal, one for each section into which " the Zone of Attack" was divided, but afforded the besiegers but little information. The balloon was wound off from a windlass, which automatically controls the rate of ascent so as to keep it uniform. The balloon has also an air compensator, which allows it to retain its spherical form and ascend in a 39 foot-seconds wind; whereas the balloons of the besiegers without compensator, could not be used if the velocity of the wind was greater than 22 foot-seconds. Photographs were taken from the balloon up to distances of nine miles. Kites were also used for photographic purposes. It consisted of a plane and two triangular cells without tail. Three or four were sent up according to strength of wind, and were fastened by cords to a steel cable. When they reached a certain height of about 130 feet, a photographic apparatus was run up the cable, by a special mode of suspension, which allows of its being adjusted in a horizontal or vertical direction. The stability of the apparatus being ensured at a precise moment, the photograph is taken by the aid of an electric wire. The balloonists of the defence, although they could not detect by ordinary observation the light railway lines themselves, could grasp their general direction by the movement of the rolling stock passing along them in front of defined objects such as a house or a tree, &c. As regards

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works, only those which were finished could be detected. By the aid of the photographs taken from the kites I have alluded to, the locality of two of the three divisional parks, as also that of twelve batteries were established. Fire would have betrayed the presence of these latter, and there is no doubt it would have been possible for the balloonists to have indicated on a map not only the position of each battery but also of each piece. On the other hand, the balloonists of the attack practically saw nothing of the defence such as it was, partly from the sun being invariably in the eyes of the observers at the time in the morning when the reconnaissances were attempted, and partly from the fact that as constructed, there was very little to see of the works, and that light railways were not laid by the defence. To sum up, the impression is, that balloon observers will rarely be able to give useful information to the defence during the preparatory work of the Siege, *i.e.* the investment, the first operations and the construction of the Siege batteries. But when the railways are working or the batteries open fire, it will be possible to get useful information from them, provided they have previously made numerous ascents, in order to acquire a thorough knowledge of the ground, and are working under favourable conditions of time and weather. It was considered that the balloon service should have been more closely connected with the Artillery Commander instead of practically monopolized by the fortress Commander.

Now let us turn to the attack.

The consideration of these operations permits of their being dealt with under three headings. The preliminary operations carried out by the technical Siege troops prior to the arrival of the Field Army, in order to save time, and the expense of bringing the mobile troops to the scene, before continuous useful work at Peace Manœurres could be found for them. This period covered the interval from the 1st to 19th August, and necessitated reversing the order which one would of course have to adopt in war, when nothing can be done worth considering by the technical troops in a Siege, until the Field Army has practically established the Investment. But the construction of railways and the formation of parks, &c., takes time, during which period the infantry would have had practically little to do in Peace operations.

The second period was that embraced between the 20th and 23rd August, when, on the arrival of the Field Army, the ordinary field operations had to be undertaken against the mobile forces of the defence leading up the establishment of the Investment. As regards the work of the technical troops these two periods practically merged into one, and I shall deal with it accordingly. The third period lasted from the 24th August to 5th September, the Siege itself, and at these Peace Manœuvres, was almost the least interesting of the three periods, the preliminaries absorbing the most attention of the directing authorities.

On the 1st August, the Siege Artillery and Engineers having assembled at Foulain, their Commanders were informed as follows, that the Commander-in-Chief had determined that his Point or Front of Attack of the Fortress would extend from the works of Fays on

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the South to the battery of Hume on the North (both inclusive), a frontage of three miles of the fortress, but that at the same time, he wished a portion of the Siege Artillery to be devoted to controlling the fire from the forts and works of that portion of the enemy's position extending from Jorquenay through Rocheri to Sainte-Menge. He had determined to detrain his Field force at Foulain. The Siege Artillery Commander was permitted to choose roughly the general alignment of his siege batteries, and exactly, the positions of the principal Park (in conjunction with the Engineer Commander) and the Divisional Parks. These Parks were to be formed, and the light railway laid connecting them with each other, and Foulain with the principal Park; this work if possible to be completed by the night of the 19th August.

The Siege Artillery Train consisted of three Divisions. No. I. division and No. II. division each of 11 batteries, and No. III. division of 10 batteries, total 32 batteries; 4 batteries were allotted to the principal Park, and 2 to each of the 3 Divisional Parks, with 3 sections of Artillery Park and workmen, &c.

The armament consisted of 54 guns, viz: 3 batteries each of 6·1″, 4·7″ and 3·7″, and 138 howitzers, viz:—15 batteries of 6·1″, 6 batteries of 8·7″ and 2 batteries of 10·7″. To the I. division were also attached 2 6-gun batteries of the Rimailho 6·1″ howitzers.

Either Villiers-sur-Suize or Bugnières suggested themselves for the position of the Main Artillery and Engineer Parks; but the Siege Artillery Commandant finally recommended the former as the most suitable site, which the Commander of the Siege Army duly sanctioned.

Villiers-sur-Suize is not on the main railway from Chaumont to Langres, although it could have been so connected with it, by ordinary gauge had the railway companies of Engineers who were at their instructional camp in the neighbourhood, been permitted to carry out the construction. But sanction for this could not be obtained. The village of Villiers is in the Suize Valley which runs parallel to the front of attack, and consequently was in prolongation of the line of the three Divisional Parks, which it was decided were to be established at Ormancey for the I. Division, Marac for the II. Division, and Faverolles for the III. Division. Theoretically it should have been in rear of these Parks, as would have been the case at Bugnières, which is situated at the head of the cross-roads leading to these three villages in question. Bugnières was, however, further still from the main railway than Villiers, and it would have been no easy matter to keep up communication with the Divisional Parks, as the roads traverse the Bois de Marac, which is very dense, and then passes over the watershed of the Suize which runs in a deep valley. Finally at Bugnières there is an insufficient water supply, and water was required in great quantities not only for men and horses, but for the locomotives of the light railway.

Villiers is nine miles from Langres in a direct line, five miles from Ormancey, three and a half miles from Marac, and two and a half miles from Faverolles; but of course owing to the numerous slopes the track was much longer. Again, although in a straight line,

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Foulain, the nearest connecting station on the main line was only three and a half miles, the actual length of the road was five miles. Being in the same valley as the Divisional Parks, there was little difficulty in keeping up supplies between Villiers and the latter, as the horse transport would be moving under cover in the gorges of the Suize Valley and so protected from the fire of the defence.

The decision arrived at by the directing Authorities to connect Foulain by the 23·5 "Pechôt-Decauville" Siege railway with Villiers instead of by a branch of the main line, was a source of much delay and waste of labour, involving as it did, the unloading and re-loading of the material for the Artillery and Engineer Parks at Foulain on its arrival there. Thence to Villiers it was transported partly by the light railway and partly by horse transport. The latter consisted of 160 Siege wagons, 24 platform wagons, and 560 draught horses. The stores placed at the disposal of the light railways which is of 5½" broader gauge than ours were as follows:—

56 miles of line, 80 turn-tables, the material for three watering places, 12 water cisterns, 320 points for changes of direction, 27 locomotives, 500 wagons, 60 trucks and 6 water cisterns. The rails, owing to the necessity for economy of time and material, had to be laid above instead of on the level of the road, (which was a source of much trouble to the wheels of the horse transport), and were supported by metal sleepers. The engines are constructed so that they can be run forwards or backwards with equal ease. They consist of two small locomotives with their fire boxes connected, so that they have two smoke stacks, one at each end, the driver's platform containing the driving gear being in the middle. The boiler is so arranged that the level of the water over the fire box remains constant even when the line slopes sharply. The connecting rods of the wheels keep a good grip of the rails however irregularly the line may be laid.

To pass from the valley of the Marne in which Foulain is situated to Villiers-sur-Suize the height of which is 1,050 feet, a spur has to be crossed at an altitude of 1,370 feet and the descent into the latter place is also very abrupt—a slope of $^1/_{15}$—as were many other portions of the route. The laying of the line took nine days including the erection of the station platforms of Foulain and Villiers-sur-Suize. Including the two stations, the actual laying of the line only took two and a half days, and the number of men employed were 700. The principal delay was due to an insufficiency of curved rails for changes of direction. In spite of hitches, the rate of laying was two miles in a day of ten hours work, apart from near the stations, where the work, on account of the points, &c., was of longer duration. The tracing and marking out of the line was carried out by night reliefs.

It was not thought necessary to ballast the line, as it was laid over either macadamized roads, or fields, which the extreme heat had baked hard. But this belief was not well founded, as the storms which took place after the manœuvres, when the material from the Parks was being moved back to Foulain, caused the rails to give away on the soft ground created by the rains, and they had to be supported by chesses pushed underneath them.

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It was no easy matter to construct this railway of five miles between Foulain and Villiers with its two stations and three sidings, and it involved much hard work.

When finished, the railway service was worked as follows:—

The trains, consisting of a locomotive and either two wagons fully loaded with nine tons each, or three partly loaded with this total weight of 18 tons, followed each other at 20 minutes interval. They were hauled by two locomotives from Foulain to the first siding, at which point one locomotive was detached. In order to get out of the valley of the Suize, the slopes were more difficult than those leading from the Marne, as the lines described numerous curves which are considered equivalent to an increase of slope.

Theoretically, 72 trips at the rate of 3 trips every hour might have been carried out, but in reality only ⅔ of this number, that is from 30 to 40 were actually performed in order to give rest to the men, and to make allowance for hitches caused by unforeseen accidents or delays. Working at night was avoided. 1,300 tons of ammunition which represents the weight of expenditure of a day and a half's firing, should have been transported by the railway; but actually only three quarters of this amount could have been conveyed.

In about 15 days, 1,900 officers and men of the Siege Artillery and Engineers completed the laying of this line, and transported along it 3,500 tons of sleepers, &c., 10,000 tons of Artillery material, and 1,500 tons of ammunition. Bnt the general official opinion was, that the Engineers and not the Artillery should have laid the railway, and as I have already stated, that that portion of it between the main Parks and Foulain should have been broad gauge. What we may call the second stage of construction commenced on the 10th August, when the railways connecting the Main with the Divisional Parks were commenced. One line ascending the right bank of the Suize fed Faverolles; another line crossing to the left bank bifurcated to meet again at Marac whence to Ormancey it was a single line. These branch lines had not to climb steep escarps, and beyond the construction of a bridge across the Suize in order to ease the traffic on the existing bridge on which there had been previous to its erection, several accidents, their construction calls for no particular comment, beyond noting that their rate of advance was about two miles a day with reliefs of 200 men.

The whole of the above work including the formation of the Parks with their material, was supposed to be concluded in the preliminary period from 1st to 19th August (inclusive). As, however, the construction of all the railways went on continuously as a matter of convenience for the operations, I may as well anticipate events, and conclude my description of the same, with some account of the establishment of the third and final stage of their development, the linking up of communication by their means between the Divisional Parks and the batteries and intermediate ammunition depôts.

Although under the protection of the Field Army Operations leading to the establishment of the line of investment, a reconnaissance was made by the Siege Artillery and Engineer Commanders as to the most desirable point of attack, as also the selection of suitable

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sites for the batteries of the Siege Artillery position, these had been actually studied and determined on in almost every detail, previous to the manœuvres. This was under the somewhat elastic assumption, that in peace, the surroundings and approaches to all important fortresses have been carefully studied under the "ægis" of the General Staff and also a general knowledge acquired of the principal permanent works and their armament. The allotment of the batteries to their several positions, and their objectives were consequently considered settled, and all that was necessary as regards the railways connecting the batteries with their Parks in the preliminary period, was to trace out the lines they would follow, and to walk over the roads during the actions preceding the investment. Indeed many trenches might have been seen on the high roads indicating the points at which the railways would subsequently pass in the early operations of the Field Army. The work itself, could not, however, actually by the orders, be commenced till the 24th August when the investment was established. From that date till the 1st September about 47 miles of line was constructed, viz:— 33 miles from the first and 2nd division Parks to Ormancey and Marac, and 12 miles from the 3rd division Park at Faverolles, with numerous sidings and ways of approach to each battery. For the laying and upkeep of these railways, the directors of the Divisional Parks were respectively responsible, the railways from these latter to the Main Park and thence to the main line of railway constituting one of the responsibilities of the Director of the Main Park.

The working of the railways between the Divisional Parks and the batteries was carried out on the "group" system. This consists in starting several trains in succession, which are concentrated at the points of destination on their arrival there. As soon as they have discharged their load they return in reverse order to their original starting place. When a time table can be adhered to the "mixed" system is considered preferable. That is to say, to start three or four trains one after the other from either end, the length of the line being made sufficiently long to permit of shunting them there. Indeed this is the system laid down in the French Regulations for adoption with this 23·5″ railway.

The average daily expenditure per gun of ammunition is calculated at the rate of 100 rounds for the 3·7″ and 4·7″ guns, 80 rounds for the 6·1″ gun and howitzer, and 60 rounds for the heavy 8·7″ and 10·7″ howitzers. So that for a Siege train of 192 pieces, the railway would have to convey it is reckoned 500 tons of ammunition per day from the Park to the various Artillery positions. I have gone into this question of the construction and formation of Siege railways somewhat fully as it is a duty in which we Gunners may have to cooperate with the Sappers very freely, but in which we have not had much experience hitherto. (See sketch of the railway at work). From this long preliminary period of nearly three weeks, I will now proceed to the short second period of only four days, which covered the operations from the arrival of the Field Army at Foulain to the establishment of the Investment.

On the 19th August, the Field forces of both sides arrived at

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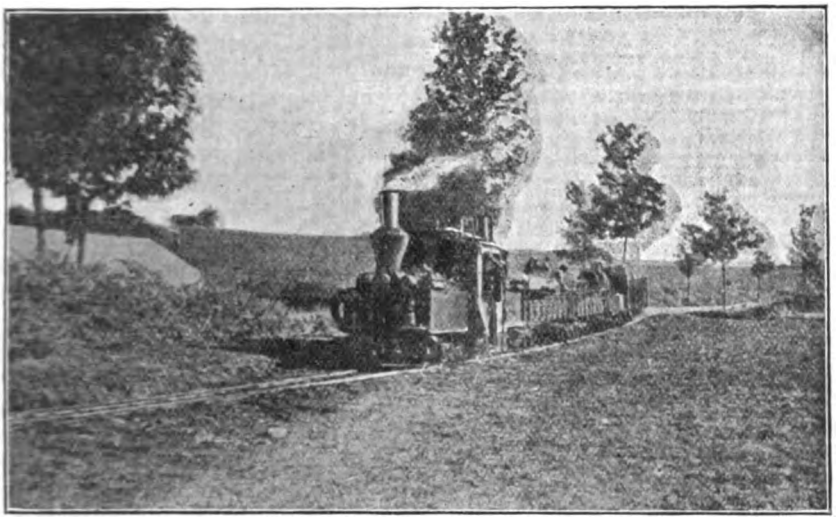

Siege Railway at work.

Foulain and Langres respectively, and moved into billets and bivouacs, the besiegers at Foulain and Villiers, and the defenders at Rolampont and Marac.

At 8 a.m. the following morning the former advanced on Langres, and in theory drove back the defenders from a position they had taken up round the farm of Tillois, on to a line Faverolles—Bois de Faul—Martroi.

Early the following morning (21st) the defending force took up the following positions. One regiment held the line from Faverolles to Faul Wood and Martroi; the remaining regiment of the brigade was posted in rear between Marac and the La Pâture Wood, and the Artillery (Field) was brought into action, two batteries in front of Martroi, well hidden by a pine wood, whence they enfiladed the front of the line held by a regiment, whilst the third battery of the group was to the East of, and near, the village of Marac, in a fine position, whence it could sweep with its fire the whole of the enemy's approach up to the Suize Valley. The Cavalry squadron covered the left flank and patrolled the Wood of Marac. General Ruffey, Commander of the defender's mobile forces, was particularly anxious about this flank, as if Marac could be captured by the enemy, it was certain that the defenders would have to retire and might even be cut off from Langres.

To remedy this, General Cornille, the Governor of Langres, had put the Wood of Vévres into a state of defence, in order to cover the retreat if necessary of General Ruffey's force. The attack was long in developing as the enemy advanced perfectly concealed, but at 9 a.m. heavy firing broke out in the Jussey Wood, and the two batteries of a brigade with an escort of one Infantry company of the defenders, suddenly found themselves under this fire, and although they limbered up as quickly as possible, they were ordered out of action by the Umpire for two hours. The Regiment near Faverolles had to retire on two hills to the South, which with Marac constituted

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a formidable position. A column of the besieging force now debouched from Martroi, but at the same moment, it came under the fire of the heavy guns of Fort Sainte-Menge, and the Umpire checked its advance accordingly. In the centre the column which occupied the Faul Wood advanced very slowly under cover of the fire of its two heavy batteries and it became evident that the main attack would come from the left.

Soon a long column of the enemy appeared on the road from Leffond to Marac, and their 75 cm. Q.F. batteries shortly after took up a position East of the Wood of Marac. It was now after 10 a.m. and the batteries which had been put out of action in the Wood of Jussey were allowed to come into action, and opened an effective fire. At the same moment, General Ruffey,seeing the enemy had reached Marac, made a counter-attack with the Regiment on the latter place. Taking advantage of a deep ravine which runs round Marac, the Regiment was able to advance under cover and fall on the enemy's flank, compelling him to change his front as they charged on his columns. This counter-attack would have most certainly proved successful, but at this moment, the Director of the Manœuvres sounded the "Cease Fire" and ordered the defenders to retire towards Langres, not on account of the state of affairs, as the attackers would certainly have been driven back, but to suit the scheme of the manœuvres. On the 22nd and 23rd, somewhat similar operations between the mobile forces took place, the defenders each day being directed to fall back nearer their principal line of defence, which they finally occupied on the evening of the 23rd to the East of the Mouche Ravine. The Line of Investment was then supposed to have been completed by the attackers, 5½ miles from the outskirts of Langres, the Siege Army taking up a position for its outposts 1½ miles from the defenders advanced works, the line of heights above the villages of Saint-Martin and Saint-Ciergues, the Woods of La Vèvre and Morgan, and the ridge to the South which forms the left bank of the high valley of the Mouche. The "line of cover for the Artillery" was taken up on the crest of the hills which command the Mouche Valley, admirable positions existing in rear of the same, on which to place the Siege batteries. For the first time in manœuvres in France, modern pattern machine guns were attached to one of the regiments of the attackers, and some new pattern water carts with motor form of transport. The guns of the permanent forts of the defence took part in these actions, but it was remarked that no attempt was made by the attacking infantry to open out or conceal themselves in any way, and that in real war, their losses would have been enormous. During these two latter days, a brigade of infantry was left with the Sappers to put into a proper state of defence the positions captured on the 21st and 22nd by the attackers. From the 23rd, the outposts were out night and day, and on the side of the defence, the works constructed at the beginning of the preliminary stage of the operations were garrisoned, and final touches put to the defences generally in their "principal line of defence."

The "Zone of Attack" synonymous, on account of the other Army Corps being imaginary, with the "Line of Investment," ex-

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tended from Rochetaillée on the South, through Mardor, Beauchemin, and the Bois de la Pâture to Rolampont N.W. at the tunnel of Le Petit Pont of the Chaumont-Langres railway. The Head Quarters were at Marac, and the troops billetted in surrounding villages, or else encamped, when insufficient accommodation existed in the latter. The construction of the batteries marked the commencement of the 3rd period.

The line of frontage of the I. Division batteries extended from the Voisines-Perrancey road to the Chatillon-Beauchemin and Langres road. It ended at Beauchemin, on an imaginary line connecting this village with that of la Papeterie.

The batteries were emplaced as follows:— the ground South of the Bois de la Vèvre was reserved for the two Rimailho heavy batteries, whence they could best cover the advance of the assaulting infantry. Their objectives were the Work at Fays and the defences between this work and that of Perrancey. The 10·7″ Mortar Battery had as its objective the parapet and magazines of the small fort of Virloup. The other batteries were to fire on the latter, the Work of Perrancey, the fort of la Pointe de Diamant, the Hume Battery and the central Citadel.

The frontage of the II. Division extended Northward from that of the I. Division up to a line connecting point 420 at the entrance of the Bois de la Folie South of the village of Chanoy. Its four batteries of 8·7″ mortars had for their objective the fort of La Pointe de Diamant. Its other batteries were to fire on the same fort, as also on the batteries of Rocheri, as well as on the Works on points 443 and 435 of the Jorquenay position.

The batteries of the III. Division extended Northward from those of the II. Division to the Northern extremity of the Bois du Châtelet to the W. of Rolampont. Their objective was the Fort of St. Menge and the advanced works in its neighbourhood.

The extent of frontage of the Zone of Attack was about nine miles in a direct line, and it was divided into two sections, the Northern including the Woods of Vaubrien and la Pâture with three batteries, to the Bois de la Vèvre; and the Southern, the remainder to Rochetaillée, where it was supposed to connect up with the second or imaginary Siege Train.

The rules governing the construction of Siege Batteries are somewhat similar to those for our Siege Artillery. That is to say, the sites for the Observation Stations are first selected and then the alignment of the battery is traced. The construction of the batteries is supposed to take two nights, in ordinary soil and circumstances the work on the 1st night covering all that can be done without calling the attention of the enemy on the morning after, to the position of the battery as distinct from the general line of the besiegers' infantry trenches. On the second night, the batteries are erected and obstacles placed. The whole of this work was supposed to have been carried out, and the batteries armed by the 1st or 2nd September. But in reality only four 6-gun batteries had been fully constructed and armed by then, namely:—two of the batteries for the 6·1″ Siege howitzers, one battery for a Rimailho heavy battery equipment,

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and one battery for 10·7″ mortars. The first three batteries were to the South of the Bois de la Vèvre, and the Mortars to the North of it. All the remaining batteries were incomplete. The cause of this was, that the rocky nature of the soil had not been taken into account, and that the time allowed was not sufficient for their completion—under these circumstances each of the three Divisions were directed to construct therefore only one or at the most two complete batteries. Deductions were then drawn, taking into consideration all the men available, but without any allowance for tactical considerations. Besides the batteries were on a Peace footing of about 126 workers at the maximum (including Reservists). It is sufficient to say here that the regulations were faulty and not complied with. All the batteries were however of course traced, the platforms laid in most cases, though some were certainly left in the Divisional Parks; all the guns and howitzers brought into position, and the battery ammunition Depôts all constructed with much care in accordance with regulations. The Divisional Parks were also well laid out and connected with the batteries by rail, and telephone lines of communication were established by the Engineers throughout the "Zone of Attack." The armament of the batteries was brought up by horse transport. The 10·7″ mortars were installed in their position at the Bois de la Vèvre on the night of the 31st, and caused much trouble in their movement over the broken ground and steep slopes between Foulain and Villiers, a whole battery of men being required to supplement the haulage of the transport teams. The wheels of the travelling wagons for these pieces were of great diameter and breadth of tyre, to facilitate their movement over soft ground. All gun stores and platforms and ammunition were transported along the light railway; but in certain places where the smoke from the engines would have revealed their presence to the defenders, horses were substituted for the engines At Ormancey, Martroi, and the steeples of the Churches of Mardor, Beauchemin and Marac were located the chart observation stations for the batteries of the groups. At the observation stations for the group commanders, where required, the Durand ladder was installed. The O.F. Stations for the battery service were generally installed in trees, a seat slung by a forage rope being "rigged up" for the Battery Commander. The sketch shows the dispositions (in detail of the 2nd Division, which may be regarded as typical), of all three divisions.

Nos. 1, 2 and 3 batteries were for 4·7″ guns. Nos. 4, 5 and 6 for 6·1″ howitzers. No. 6 the only one really constructed. Nos. 7 and 8 were for the 8·7″ mortars, for which the metal floor plate platforms as for the 10·7″ mortars, were laid.

The infantry trenches were well made, but obstacles were indifferent, mostly limited to wire. On account of the rocky nature of the soil, no arrangements were made for mining. This was a great pity now that it is generally recognised that breaches in Forts will have to be made in future by mining almost as much as by Artillery fire. Whilst the batteries were being constructed, the Engineers were busy laying their telephone system of communications throughout the whole zone of attack. It was carefully organised, but did not always work satisfactorily. Thus when carrying out rail-

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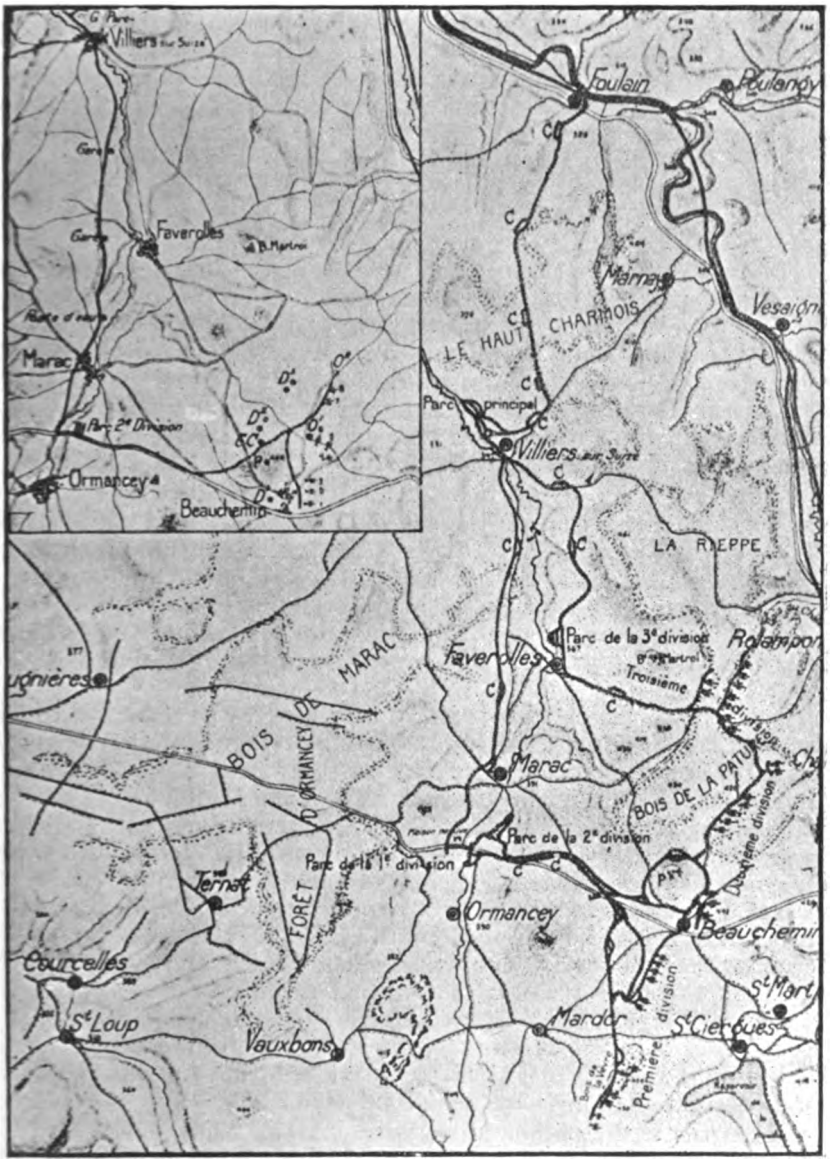

Sketch of Attack Batteries.

SIGNS IN SKETCH.

G.C. Horse Posts along the line of Railway.
P. Divisional Commander's Station.
D. Battery Ammunition Depôts.
△ Observation of Fire Stations.
⊙ Group Observation Stations.
C. Railway Crossings.

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way repairs, the working parties cut the underground telephone wire. Then again in spite of slits made in the aerial line to allow free passage to the cable of the captive balloons, the line was cut. It is said that the arrangements for the organisation and working of the telephones as well as the light railways would have been better carried out, had they been allotted to the duties of the Commanders of the Divisional Parks each in his own section. In our army in which it is understood the Ordnance Advanced Depôt, is to take the place of the Artillery and Engineer Parks, this would seem absolutely necessary. However, at present, this Ordnance Advanced Depôt for Siege Warfare, exists only in intention, and no details as to its composition or equipment when given a corporate existence in War, have apparently been drawn up. Personally I doubt its being altogether an efficient substitute for the foreign system of Parks, in any case, as there are so many other duties which devolve upon the Commandants of the Artillery and Engineer Siege Parks, than the mere issue of stores and ammunition.

A daily diary of the state of the works and pieces of both besiegers and defenders (as far as could be ascertained) was strictly kept by the Staff Officer of the Commander of the Siege Army. This is regarded as a most important duty. During this period, the mobile forces of both sides were busy, as were the heavy guns in the forts of Sainte-Menge and la Pointe de Diamant on the besieger's working parties, and outposts were out night and day on both sides.

On the night of 27th—28th a night sortie was made by the defenders covered by artillery fire. The noise of the latter followed by infantry fire attracted the attention of the guards of the approaches in the zone of attack, who gave the alarm immediately to the artillery, engineer and infantry working parties in the neighbourhood of the area threatened. The latter throwing down the tools with which they were at work, siezed their arms and hastened to repulse the attack. Reserves shortly after arrived, and the action continued till five a.m., when it was stopped by the Director of Manœuvres. The criticism was, that the attack was conducted with much greater rapidity than would be possible in war, that the fire of the Forts which preceded it was not only a tactical error, as it precluded all chance of a surprise, but that in spite of the searchlights, the layers of the heavy guns in the Forts could not have seen any targets, nor could any observation of fire have been conducted.

On the 29th another sortie by night was made by the defence upon the plateau of Beauchemin covered by a feint on Humes. The outposts of the attack were driven in in two places and the trenches in their immediate rear captured. The enemy reinforced drove the defenders back into the Valley of La Mouche under the protection of their fortress guns on the Arbelotte Plateau.

On the night of 31st—1st the besiegers having almost completed the works and armament of their batteries, retaliated and attempted with their mobile troops at dawn to sieze the right bank of the Mouche Valley. One column marched from Saint Ciergues on Perrancey, and captured the work of Virloup which was unoccupied,

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and advanced on the work of Perrancey. Another column from Voisines and Courcelles advanced on Vieux Moulins and Noidant-le-Rocheux, which positions it found unoccupied. They found the defence so weak in numbers, that the whole area was placarded with notices such as "This trench is occupied." "One gun represents a whole battery with complete ammunition supply, &c." This made the operations somewhat of a farce from the attack point of view. The movement was then stopped by the Director, whose decision was, that the attack by the column on the plateau above Vieux—Moulin and Noidant-le-Rocheux had succeeded, but that on Virloup and Perrancey had failed, as the crossing of the Mouche Valley by a column of only six battalions under the "General of the day," could never have been effected in war.

All the batteries of the attack being fully armed and supplied with ammunition by the night of the 2nd September, fire was opened from all the batteries at 7 a.m. on the 3rd. The balloons being sent up from in rear of the batteries at the Bois de la Vèvre, and of those near the junction of the road leading from Mardor to Beauchemin. The guns of the defence made a feeble reply and the bombardment ceased at 8 a.m.

On the 4th September some specially constructed works on the Virloup and le Fays Plateau were bombarded with shell from 4·7″ guns and 6·1″ howitzers in rear of the Bois de la Vèvre, and on the 5th September the 10·7″ mortars also in rear of this wood, bombarded with shell, works on l'Arbelotte. The results of the practice were satisfactory so far as hitting the objectives were concerned, but the conditions were absurdly easy. At the commencement of the practice, not only were the targets not concealed, but were really marked like beacons, and could be seen from long distances. Then the works fired at, were of very feeble construction. Thus in the besieger's assault, I have referred to on the 1st September, the infantry having crowned the heights of Perrancey—Virloup set to work to destroy the work erected as a target for the practice. It was composed of walls of loose stones, which could be tumbled over by hand. It was certainly partially restored during the 2nd and 3rd September, but one may consider it as being partially demolished when struck by shell on the 5th September. Half charges were only used and the bursting charges of the shell consisted of about 1/10 melinite, and the remainder resin, in order to minimize the risk of accidents. Consequently many of the shells never burst at all. There were many severe comments on the fact, that although over 200 pieces were in position, only 24 were mounted on platforms laid sufficiently solid to resist the recoil of firing with shell, and that even these 24 pieces could not fire simultaneously, doubtless largely due to the fact, that no shell were allowed to fall outside the area of the Virloup—Perrancey spur.

The duties in connection with ammunition supply, which are very heavy in a siege, never seem to have been practised. As regards battery fire discipline, in a general sense, it is not very dissimilar to that laid down in our manual, but the French views of fire

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control and fire tactics in a siege, differ somewhat from our own. Fire concentration they have given up as impossible of accomplishment by Siege Artillery Groups. Each battery is assigned its special objective, but it is considered all the better, if the latter can be allotted to one or two additional batteries, and as a principle, it is stated somewhat obviously, that a superior fire should be distributed on the point of attack. This change they say results in the great progress made in artillery, viz: Rapidity of fire, greater shell power, and improvement in laying arrangements, which permit of a more accurate dispersion of fire being possible. One can then allot they say to each Unit a certain task, or in other words, decentralise your Siege Artillery in the same manner as is being attempted in this respect, as well as in initiative, in all the other branches of the French Army. This seems to me a specious argument, but not a convincing one. The consequence is, that the instructions lay down, that the Fire Commander preserves only a very general direction of the fire of his group, allotting the role of each unit according to the requirements of the task he has to perform, and the strength of the enemy's opposing batteries. When the objective battery is silenced the fire is turned on to another battery. But this must in any case be within a narrow arc of the original target, as the field of fire of a Siege Piece is only, it is stated, 40° in breadth. The critics considered that in spite of all these instructions, more useful experience would have been obtained had the fire of at least some of the 36 batteries in position been concentrated on one objective. Although not resorted to at these manœuvres, it is hoped in war that much of the firing will be conducted with the aid of maps and charts.

After the practice on the 5th, under cover of a bombardment by all the batteries, the infantry fell in for the final assault on the defender's main line of defence on the plateau above la Mouche Ravine. But unfortunately the Director of Manœuvres owing to the great heat, cancelled the operations, and so brought the manœuvres to an abrupt termination one day sooner than had been originally intended. Apparently the assaulting column for a Fort was composed very much as with us as follows: A covering party to cover the advance of the assaulting columns, the stormers with carrying party, which include the engineer party if obstacles of a serious nature have to be removed, the supports, the artillery party for destroying guns, etc., the stretcher party and the reserves. During the eighteenth century it was an understood law that the defenders, unless they submitted after the blowing in of the counterscarp, and a breach made in the outer wall of their Fortress, were liable to receive no quarter on its capture. In the early part of the nineteenth century, the French modified this, to the effect that the Fortress should stand one assault. The object of this admitted right of the besiegers was in order to minimise the loss of life which continual assaults involved. It seems improbable in future, however, that after the main line of defence has fallen, the defence will be much longer protracted. The French consider that grenades filled with liquid air will be used in the assault in future sieges.

Some hostile criticism has been passed on these 36 days man-

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œuvres by French Senior Officers,[1] but the opinions of the French General Staff have been kept very secret. The general opinion, however, was, that broadly speaking the "Instructions for Siege Warfar" for the French Army meet the purpose for which they are intended, and that the work of the Siege Artillery and Siege Engineers under their respective Generals was with some small exceptions admirable. It was considered, however, that the Generals Commanding wanted more practice in the command of troops in the field, and spent too much of their time with their Staffs in drawing up and writing unnecessary lengthy orders, which only succeeded in making the operations mechanical, and without the reality of war, and moreover deprived their subordinate Commanders of all exercise of initiative and resource.

The operations did not appear to have given much useful instruction in many of the faulty points in the conduct of the Siege Operations round Port Arthur, amongst which seem to have been the following:—

I. Ignorance on the part of the Japanese of the details and strength of the Russian positions, due mainly to relying too much on information acquired before the Siege, and to the lack of properly conducted balloon reconnaissance.

II. Over estimation by the Artillery Commanders of the effects of the Siege Artillery fire, and neglect to endeavour to systematically make a breach in the forts previous to their assault.

III. No use made of search lights by the besiegers worth considering.

IV. Ineffective escalading materials.

Finally it seems to me most desirable that we should carry out some similar operations in this country, if only on the modest scale of those conducted last September at Antwerp by the Belgians. In which case it seems to me that a study of operations such as these at Langres, should not be neglected by us, as they may serve as a useful example.

APPENDIX A.

The number of pieces in a French Siege Train varies according to circumstances, but up to July last it consisted of 180 (or 60 per Division) normally, divided into mobile, light siege, heavy siege and special armament as with us. At Langres it was as follows:—

Each Division had 1 battery of 6·1″ guns, 1 battery of 4·7″ guns, and 1 battery of 3·7″ guns. In addition, the I. Division had 7 batteries of 6·1″ howitzers and 1 battery of 10·7″ mortars (really howitzers). The II. Division had 3 batteries of 6·1″ howitzers, and 4 batteries of 8·7″mortars (really howitzers) and 1 battery of 10·7″ rifled mortars. The III. Division had also 5 batteries of 6·1″ howitzers and 2 batteries of 8·7″ mortars. Each battery consisted of 6 pieces.

[1] "The Spectateur Militaire" of 1st of the current month, is I consider, unjustly hostile in its remarks.

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There were thus 66 pieces in each of the I. and II. Divisions, and 60 pieces in the III. Division, making a total of 192 pieces in the Train. These various pieces correspond to our own, as follows, but are inferior to them in power as lighter in weight. The 6·1″ gun to our 6″ siege gun of 5 tons, the 4·7″ gun to ours of similar calibre, the 6·1″ howitzer to our 6″ howitzer, the 8·7″ mortar to our 8″ R.M.L. howitzer of 70 cwt., and the 3·7″ gun to our old 13 Pr. The 10·7″ howitzer has no equivalent in our Siege Train, as it throws two kinds of shell heavier than anything we possess, viz: 330 lbs., and 510 lbs. respectively, to a range of 7,100 yards, and is really a coast defence piece provided with a siege mounting. Our 9·45″ Austrain howitzer is the nearest approach to it. The pieces vary in age from 25 to 35 years, and the mode of employment of their fire against various forms of Works, Personnel, and Balloons, &c., is similar to that laid down in our Service for the corresponding pieces, and calls for no special comment. But the mountings of two of the pieces do call for some description. I refer to that of the 10·7″ mortar, and to that of the 6·1″ howitzer (when employed as a Heavy Battery Piece), of which two batteries which accompanied the Field Army, were on the siege batteries being constructed, attached to the I. Division of the Siege Train. The history of these mountings is as follows:—

After the satisfactory results attained by the 11·1″ howitzer in the Siege of Port Arthur, the French military authorities set to work to devise some means by which a somewhat similar piece with greater mobility than that of the Japanese somewhat obsolete Belgian coast defence howitzer, might be introduced into their Siege Trains. The 10·7″ coast defence howitzer weighing about 5¾ tons was accepted, with the existing carriage or bed of 6⅓ tons, and two components added, a Slide and a Platform. The platform of iron is a sort of thick plate on which the slide moves. It has a pivot which serves as an axis for the revolution of the slide, to which is attached the front part of the latter. The rear portion of the slide is provided with rollers, which by means of a handle permits of its easy movement on the platform. On its upper part is an inclined rail along which the carriage slides in its recoil. In front of the slide is fixed a hydraulic brake, which is attached to the carriage. The total weight of the equipment for each mortar is 22 tons, which for travelling purposes is broken up into four components, the Piece, the Carriage, the Slide and the Platform, each constituting a distinct load. The special waggon for the carriage of the mortar alone weighs about six tons, and a battery of six pieces forms 24 vehicles drawing over a hundred and thirty tons, excluding ammunition. The equipment could not be moved along the Siege Railway, but on the roads in horse traction. (Top portion of figure shows gun and carriage, the bottom portion, the slide with buffer and platform. The French do not believe in cement platforms, which take ten days to dry after being laid).

As regards the 6·1″ howitzer, really a low velocity gun of 20 cwt. In 1903, Germany commenced the manufacture of a heavy battery 5·9″ howitzer of the 1902 model, recoiling on its own carriage, for the Field Army. The weight behind the team in this equipment

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French 10·7″ Heavy Siege Howitzer.

is, including 10 rounds of ammunition in the limber, only 57 cwt. The weight of the H.E. shell is 87 lbs., the muzzle velocity 984 f.s., and extreme range 7,500 yards. It is of course far inferior as a heavy battery piece to our 60 Pr., but the French had hitherto in their Field Army been contented with a feeble 4·7″howitzer firing a 40 lbs. shell as a heavy piece. (Vide plate showing the new equipment).

Realizing the unfavourable position of the French Army as regards heavy artillery, compared with that of Germany, Commandant Rimailho of that branch, considered how he could improve his arm-

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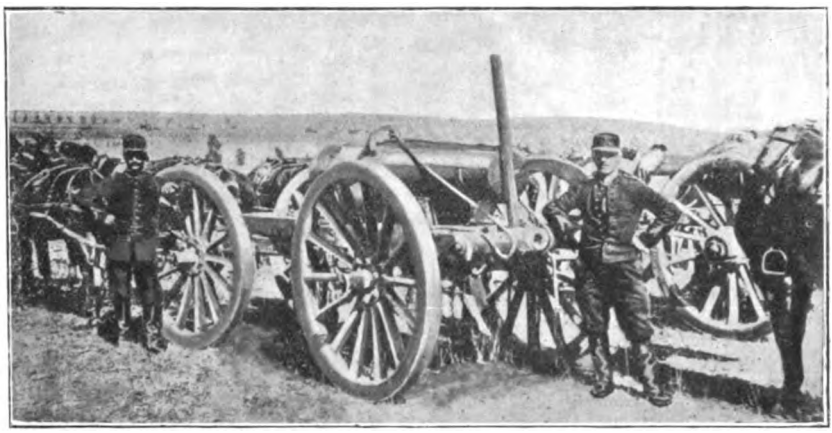
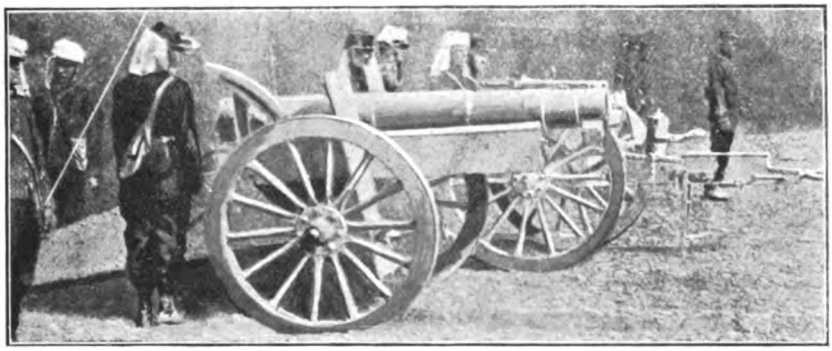


French 8·7″ Heavy Siege Howitzer.



French Rimailho 6·1″ Heavy Siege Piece.

German 5·9″ Heavy Battery Howitzer.

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ament. In the Siege Train was a large number of 6·1″ howitzers, which as regards weight, shell, and range power, was, he considered, the equal of the German piece. Its carriage was, however, weighty and less mobile, so he devised a method by which this howitzer could be mounted on the "Deport" carriage, which is that of the French Q.F. gun. This enabled it to fire 4 rounds of H.E. shell of 88 lbs. or of 90 lbs. shrapnel in a minute. He also, by making the gun and carriage separate loads each with a limber, gave it the mobility of an ordinary field gun. Each load is about 47½ cwt. and six horses each are required for the carriage and ammunition wagon, and eight horses for the transport of the gun. By a simple arrangement of safety pins, the gun can be brought into action in about 3½ minutes. Although its shooting as regards accuracy is a little disappointing, the Authorities are sufficiently satisfied with it, to have determined to introduce it into their field army, in lieu of the existing 4·7″ howitzer referred to. Two brigades of the equipment are to be attached to each Army Corps, and the heavy cavalry is to be distributed to provide horses for their transport. It is only fair to add that many French Officers are opposed to the introduction of Heavy Artillery into the Field Army.

Appendix B.

Now let us consider our own arrangements. As regards the strength of our siege train, we must first of all remember that it is unlikely that we should undertake important siege operations, until we had obtained command of the sea, when we should be in a position to release 50% of our Coast Defence Companies at Home and in the Mediterranean. We might under these circumstances, I think, call upon the Commanders of our Coast Defences to provide the following for our Siege Train—Portsmouth 1 medium and 1 heavy brigade of howitzers,—Plymouth (including the Channel Isles) Malta and Gibraltar each 1 brigade of medium howitzers,—the Thames and Medway, 1 heavy 6″ gun brigade, and the one battery of 8″ siege guns on railway mountings we should have as part of the equipment, the South Irish 1 brigade of heavy howitzers, and finally Dover and the Welsh, 1 battery each, to complete one heavy howitzer brigade. Including the 1 heavy and 1 medium howitzer brigades that the Peace Establishment of Siege Artillery expands to in war, we arrive at a total of 5 medium howitzer brigades, each of 4 batteries, 4 heavy howitzer brigades of 2 batteries, and 1 6″ siege gun brigade and 1 8″ railway battery. To these, should be attached from the field army, 6 heavy and 6 field howitzer batteries, which would give us a grand total of 184 pieces. Excluding the 3·7″ batteries whose rôle could be more efficiently carried out by the field batteries of the field army, but including the two heavy Rimailho batteries, the number of pieces in our Train would be practically similar to that of the Train which took part in the operations at Langres. At the Head Quarters of the Coast Defences, I have mentioned, the siege equipments for the units detailed, should form either part of the land front armament, or be stored as part of the charge of an Armament Officer of the

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fortress, and every opportunity in the "off season" as far as Coast Defence work is concerned, should be given to the units to acquire some elementary knowledge of Siege Artillery work with this armament.

In war, the brigades as in the French Army should be grouped in three divisions styled respectively Right, Centre, and Left division (of attack), the strength and composition of each division varying slightly according to the nature and number of the objectives allotted to them in the front of attack. The brigade ammunition depôts which would require to be manned by non-mobile units and consisting of 1,500 G.A. reservists, should be for each division, concentrated as a Divisional Park under a Lieut.-Col. He would be responsible for the ammunition, etc., supply of the division, and for the efficient working of the light railways between his Park and the batteries, &c.

In the same manner as Continental Armies have to decide on the amount of rolling stock required, and the most suitable station at which to detrain the Siege Artillery, etc., so we must consider the amount of shipping tonnage we should require for our Siege Train; and as quays with macadamized roads leading to the interior, are unlikely to be invariably awaiting our convenience, our Siege Artillery Officers must be practised in conducting Coast Reconnaissances, with a view to determining suitable landing places for the Siege Train, etc. In short it appears to me that a study of the organization and tactics of modern Siege warfare demands on our part, a close and analytical investigation of all manner of things that it deals with before we can determine the best paths to be followed or avoided.

Correction to "Duncan" Gold Medal Essay.

Page 116, lines 32 and 38, *for* "drill-books" *read* "text-books."

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Barr & Stroud Rangefinder, F.Q. Type, "Infantry," 31½ inches (80 cm.) Base, for use with Infantry, Cavalry and Machine Guns.

The approximate uncertainty of observation with this rangefinder, at a range of

600	yards is	2	yards.
1,000	,,	6	,,
2,000	,,	24	,,

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NAPOLEON'S MARSHALS

(Ex ungue leonem).

1. LANNES.

By CAPTAIN H. M. DAVSON, R.H.A.

OF all the brilliant commanders who surrounded Bonaparte in his years of prosperity Jean Lannes is the one who most excites the interest of the student of Military History. From the time when at the age of twenty-seven as an unknown soldier at Millesimo he attracted the attention of his young General, until the fatal day thirteen years later, when, as the most cherished of all Napoleon's Marshals, he fell mortally wounded at Aspern, his career was a succession of brave deeds, skilful tactics, and unfailing devotion to the man who had made him.

Lannes was born in the village of Lectoure in the province of Gers on the 11th April, 1769. His father kept a livery stable, and he himself for a short time was apprenticed to a dyer. He soon, however, gave this up for the profession of arms, and in 1793-4 served as a volunteer in the Pyrenees, where he soon obtained a small command and fought at Villongue and Ripoll. In '96 we find him in a subordinate post in the army of Italy, and from this time his career may be said to begin.

He was then, according to de Marbot "the most lively of young Gascons; witty, merry, devoid of learning, but desirous to learn at a time when such desire was rare." Napoleon himself many years after spoke of the "ignorance of Lannes" at the time when he first took note of him, that is in the first campaign in Italy. It was in Italy also a few years after that he gained his highest laurels.

For his work at Millesimo and Dego on the 14th April, 1796, Napoleon promoted him Colonel, and on May 7th, in command of the Grenadiers he forced the passage of the Po at Piacenza. A fortnight later he got his first independent command, that of a flying column raised to check the rising in Lombardy, and the inhabitants of the town of Bignasco were the first of many who learnt to fear him.

He was present at most of the engagements of this campaign, namely, those round Mantua, Arcola, where he was wounded, and Rivoli.

In 1799 he went to Egypt as General of Division, where his most noteworthy performances were the leading of the final and fiercest attack on Acre, where he was again wounded, and the attack

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on Aboukir[1] where he was wounded once more. Marmont says of him "His bones had the singular property of not being broken by the shock of bullets; they flattened themselves and in their movement turned round the bones they had struck."

When Napoleon deserted Kleber and Desaix and returned to France, Lannes was one of the select Staff who accompanied him. It is difficult to say why this should have been so; probably Lannes was broken in health, or else Napoleon had even then begun to feel the attachment for him which developed in later years. He, Murat and Marmont were the only real fighting Generals who returned; the others, Berthier, Bourrienne, &c., being little more than Secretaries. After running the gauntlet of the British fleet, the little band landed at Frejus.

He then took part in the "coup d'état" of 18 Brumaire.

At this time he suffered from domestic troubles. His wife—a Mlle. Méric whom he had married in 1795 had shown infidelity whilst he was in Egypt and a divorce was arranged on his return. On 15th September, 1800 he married again—a Mlle. Louise Antoinette Guéhéncue daughter of an administrator of forests. She was from all accounts a beautiful and charming woman, and Lannes and she remained devoted to each other until the end.

The wonderful feat which Bonaparte accomplished in the Spring of 1800 of taking his army with its artillery and baggage over the Alps is known to everyone. The details of this great march are, however, much neglected by the student. It is not, however, within the province of the present article to deal with them except in so far as they concern Lannes himself. He was given command of the advanced guard which was formed at Lausanne of about 6,000 men.

Napoleon arrived at Geneva on the 8th May, and was informed by Marescot his chief engineer that the road was barely practicable. His reply was to order Lannes to advance from Lausanne towards the St. Bernard. The difficulties overcome by Lannes corps in the Pass on the 15th were enough to make even a bold man like him quail. But by dogged persistence column after column mounted the Pass; men harnessed into the guns and baggage carts, their comrades meanwhile carrying their arms and kits. Cavalrymen stumbled along beside their horses on paths that, up to then, had only been used by goats. At last towards evening the descent was accomplished and the men bivouacked for the night; and next day Lannes took possession of the valley of Aosta.

As soon as his fight with nature was over, his fight with man commenced. He routed a detachment of Austrians at Chatillon, but was in turn held up by the little fort of Bard. This small place situated at the foot of the valley of Aosta on a rock above the river Dorea completely blocked the Pass, and was strong enough to defy for a time the whole French army; and Napoleon finding he could not force the place passed his infantry singly over the Albaredo, a huge rock which overhung the valley, and Lannes having carried the town by assault, the artillery with muffled wheels was passed through it by night through streets previously prepared with litter, right

[1] July 5, 1799, against Mustapha Pasha.

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under the walls of the fort whose garrison was apparently more noted for its bravery than vigilance.

Napoleon left a corps of conscripts to reduce the fort of Bard, and Lannes pressing forward carried Ivrea by storm and afterwards Romano. He then marched on Chiavasso and was seized with the happy idea of collecting boats and trying to construct a bridge over the Po. This work, by drawing the Austrian columns towards the spot, left the road to Milan open to Napoleon, who was still at Ivrea, and marching on this town he entered it on the 2nd June.

Meanwhile General Melas who commanded the Austrians found himself in danger of having his line and communications cut; he himself being at Turin and Ott his Lieutenant in front of Genoa.[1] He was fearful, therefore, of Napoleon pushing across the Po and defeating both armies in detail. To prevent this Ott was ordered to move on Tesino while Melas himself moved to Alessandria. Napoleon at the same time decided to force the Po and relieve Genoa, not knowing that Massena had already surrendered the town, Lannes, therefore, moved himself against Casteggio and Montebello[2] where some Austrians were reported to be. This turned out to be the whole of Ott's army which the French Generals fondly imagined to be still before Genoa.

Lannes with about six to eight thousand men was strongly attacked early in the morning by 18,000 and had the greatest difficulty in resisting. The outposts were in contact at 9 a.m., and the battle lasted nearly twelve hours.

The Division of Austrians under Vogelsberg were massed on the heights South of Casteggio, whilst Schellenberg held the village of Casteggio and also Montebello—3 miles in rear. Lannes ordered Watrin to assault the guns and attack Casteggio in flank whilst he himself assaulted it in front. Watrin after being repulsed succeeded in getting into the village but was driven out again by Ott and at the same time Lannes' troops in front were forced back.

Things at this time were going very badly for the French and it looked as if Ott by advancing his flanks would force Lannes back on the main army. This was averted by the welcome arrival of the advanced troops of Victor's corps which had marched from Brioni to the sound of the guns and arrived there about 2 p.m.

Rivaud who commanded the leading Division attacked the Austrian right flank and Chamborlac who had advanced on Casteggio was ordered by Victor to attack the heights to the South. The Austrians were gradually forced back on Montebello—Lannes entering that place about 8 p.m. after a desperate struggle lasting all day. As he said in his report " J'ai successivement enlevé six montagnes conteaux ou mamelons sur lequels l'ennemi se retirait."

Every praise is due to Lannes for the way he stuck to his position and kept up the courage of his tired and beaten troops. To attack an enemy three times one's own strength in a position chosen by himself and keep up the struggle unaided for five hours is a feat

[1] Massena surrendered to Ott June 4th.
[2] He had collected boats on the Ticino and floated them down to the junction with the Po. Watrin with two regiments crossed June 6th.

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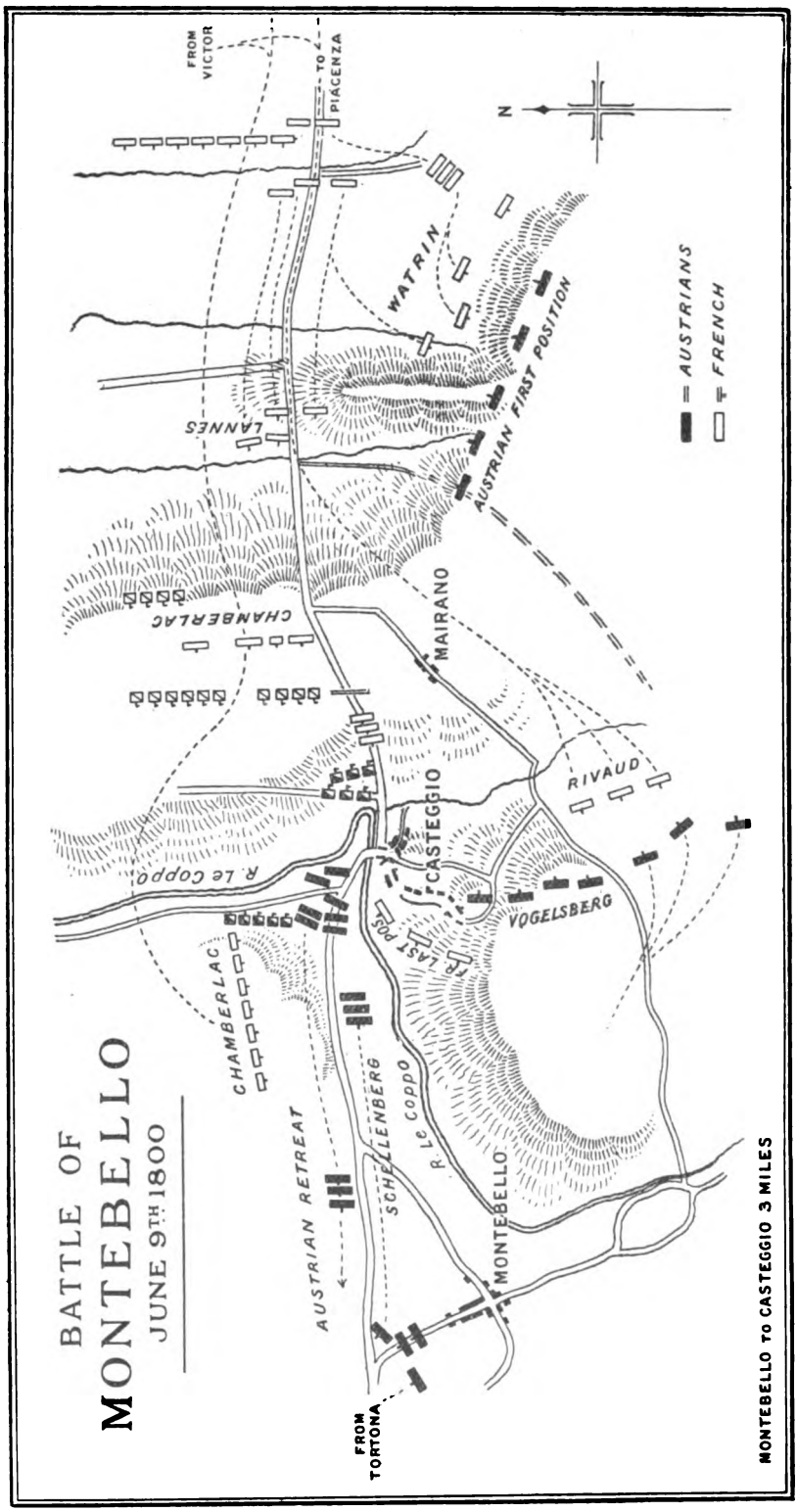

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which few troops could have accomplished. Even at the end of the day Lannes' force barely equalled that of the enemy. At the same time, but for the opportune arrival of Victor, it must have gone hard with Lannes in the afternoon, and he himself was most ready to acknowledge it, as, when eight years later Napoleon created him Duc de Montebello he went to Victor and embracing him said "It is to you that I owe my Dukedom."

Ott retired on Tortona and Bonaparte after some days of hesitation advanced his army into the plain of Marengo. The great battle of that name was fought on the 14th.

Lannes commanded the second line and later in the day he had the opportunity of making a return for Victor's good offices at Montebello. The latter had his corps in and around Marengo but was in danger of being utterly overwhelmed when Lannes profiting by a charge of cavalry headed by Kellerman, managed to get 5,000 men in line between Marengo and Castel Ceriolo. Victor's broken troops came back on the left of his corps and he had to slowly give way and abandon Castel Ceriolo; at the same time the Austrian cavalry threatened his right. Napoleon sent at once to relieve him of this and St. Cyr coming up with the reserves recaptured Castel Ceriolo and enabled Lannes to reform. He held on to his position from now till the end of the day, and at one time in the afternoon it was the only part of the whole French line which was not in retreat. The left was thrown back on to the village of San Juliano and thus the position of the whole was changed half left back. At this time Desaix's corps appeared on its return from Rivolta, whither he had been detached the previous day to cut the Austrian communications with Genoa, and the defeated left wing formed in rear of his corps. Desaix on arrival thought the battle was over and turning to Napoleon said " The battle is lost. I suppose I can only cover your retreat."[1] Napoleon thought otherwise, and remarking that Lannes was yet unshaken ordered Desaix to attack whilst the beaten corps reformed in his rear. Desaix hurled himself forward on the now wearied Austrians and Kellerman, who had reformed his squadrons which had been much cut up in the early part of the day, seized the golden opportunity of charging the shaken Austrian infantry.—This was the greatest cavalry charge of his career and one that caused his name to be carried down in history as one of the most famous cavalry leaders of all time.

The battle of Marengo decided the fate of Italy, but it was not accomplished without enormous loss on the part of the French. And the greatest loss of all was the brave Desaix who having come straight from Egypt to join Napoleon was killed in the hour of victory. He was a man that Napoleon, speaking of in after days, placed even above Lannes in his soldier-like qualities; a man, as his master said, whose whole desire was for glory without thought of self advancement, and one who would command an army corps all day and sleep robed in a blanket under a gun all night.

Marengo in Italy and Hohenlinden in Germany ended the war, and peace was concluded giving the tired armies a short time of rest.

[1] Or as sometimes reported "You have lost one battle. I can still win another."

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Next year Lannes was sent as ambassador to Portugal, and for some time with a few slight disturbances Europe was at peace. His time in Portugal was not an unqualified success, and the conclusion to be drawn is that he was more of a soldier than a diplomat. In fact at one time relations were so strained that he threw up his post and returned to Paris. Bonaparte made him return and he then seems to have been more successful. Indeed the King stood sponsor for one of his children. He was finally withdrawn in 1804.

In 1804 Napoleon was proclaimed Emperor and created most of his Generals Marshals—Lannes being amongst the number. On December 2nd, Napoleon was annointed by Pope Pius VII. and crowned himself in Notre Dame.

The Pope was very chary of being present at this function and Lannes whom the Emperor consulted on the subject, was against his being forced to be there. "If I were your Majesty," he said, "I should leave the Vicar of Christ to sit quietly in his chair, and would do whatever I wished at home by my own authority. We no longer live in times," he added, "when holy oil is an article of faith."

Napoleon retorted that most of his subjects were fools and old women and would only believe in a sovereign properly consecrated, and brushing aside further objection by Lannes on the ground of the Pope's refusal, he had the ceremony performed according to his wishes.

Pius VII. gained nothing by thus anointing the man who had overthrown the Bourbons and had boasted to the Mahommedans in Egypt that he had done the same to the Cross of Christ, and he returned to his own after long waiting a disappointed but wiser man.

The year 1804 was the last of peace, and in 1805 Napoleon decided on the overthrow of England and collected the Grande Armée at Boulogne. His army stretched along the coast from Holland to Brittany and Lannes' Division which was at Boulogne consisted of 40,000 men.

How Napoleon on finding the Austrians again in arms and that he could not command the sea, marched this army from the Channel to the Rhine need not be dealt with here except in so far as it affects the individual corps. Lannes' corps left Etaples on 27th August, and marching by Cambrai and Mezières up the Meuse and crossing the Moselle at Metz and the Rhine near Strasburg on 25th September and following Murat's cavalry established himself at Reuchen and went through the operations in October which ended in the capitulation of Ulm.

After Ulm, Napoleon occupied Vienna whilst the Austrians lay on the other side of the Danube. The river here is divided into channels and bridged by the bridge of Thabor which the Austrians were prepared to defend. During the delay in Vienna there was some talk of an armistice and on this rumour Lannes, Murat and Oudinot advanced over the bridge attended by a few troops and announcing that there was an armistice bluffed the Austrians into allowing them to cross. Alone on the other side amongst their enemies, Lannes and Murat engaged Prince Auersperg in conversation whilst their troops stealthily crossed the bridge and removed the

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means put there to destroy it. The Austrian soldiers grew anxious and an old sergeant of artillery went so far as to ask Auersperg if he were not going to fire. The moment was critical when Lannes cried out "What? Is this the Austrian discipline so vaunted in Europe?" The General, piqued, placed the sergeant in arrest and the French troops quietly took possession of the bridge head.

Of the boldness of this act of Lannes and Murat there is but one opinion, but the morality of it, to say the least, seems rather beyond those deceits which we are told are allowable in love and war. It was characteristic of Murat who was given to bluffing all his life, but it was an act which one could wish had not entered into the career of such a man as Lannes. Nevertheless the passage of the Danube was gained for the army and Austerlitz followed. Four years later in attempting this passage Napoleon lost 25,000 men and Lannes his life.

On the 2nd December the armies met at Austerlitz where Lannes commanded the left wing and had his main position on the hill Santon. The Austrian and Russian idea was to make a strong attack with their left and cut Napoleon's communications with Vienna, and at the same time to drive back the French left flank on to what they hoped would be a retreating army. Both ideas failed, and indeed Lannes so far from being driven off Santon defeated the enemy opposed to him and drove them back to Blasowitz a village on the right centre of their position. This gave an opening to Murat who charged home with great effect. The rest of the battle is well known and ended in the utter annihilation of the Allies, and then there was peace for a time, and Lannes returned to France.

Next year war broke out again between France and Prussia, and the first meeting of the two forces was at Saalfeld where Lannes totally defeated the force under Prince Lewis and the latter was killed. The main feature of this fight (October 10th) was the fine handling of the artillery by Lannes under cover of which he advanced masses of infantry which altogether broke the enemy's line.

This fight turned the Prussian flank and Napoleon then occupied the heights of Jena in front of the main Prussian army. Lannes' corps occupied the Landgrafenberg—a mountain which the Prussians had considered impracticable from the Jena side and had failed to occupy. The battle then simplified itself and was conducted under the orders of the Emperor, and at the end the whole Prussian military system was entirely destroyed. Lannes at the end of the day advanced his corps and next day occupied Vierzehnheilijen.

Jerome Bonaparte now entered Silesia which brought the French in touch with Russia who thereupon began to collect forces. Following on this Lannes and Davout entered Russian Poland, and in November the French entered Warsaw. A month later the winter campaign opened at Pultusk.

Napoleon's orders to Lannes were to bridge the Narew at Pultusk and construct a bridge head, but owing to faulty information he was evidently in ignorance of the strength of the enemy at this point. The country and roads were in a frightful state and according to Davout's despatch it took two hours to cover a league.

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Lannes appears to have been, like the Emperor, also ignorant of the enemy's force until, after a tiring march, he was making his dispositions for battle; then the full strength of the force under Bennigsen was revealed to him. This force numbered 40,000 men whilst Lannes had about half that number. Still with his usual daring he attacked. The weather was the worst that can be imagined. Snow was on the ground and sleet showers occurred every few minutes, and even between these the atmosphere was no brighter than the usual London fog. Lannes had the greatest difficulty in holding his ground. Many times his troops on the right were driven back into the woods which flanked the Moscow road, and the left, the most vital flank, where he had taken up his own position could barely hold out. At dusk, that is about 4 p.m., d'Aultanne's Division, which had been detached by Davout on learning that Lannes was engaged arrived, and this reinforcement (even then his force did not exceed 25,000 men) enabled him to hold out till night, when he retired his weary troops to their position of the morning. The battle had lasted 13 hours and both sides claimed the victory, but as the Russians retired across the Narew at night Lannes appears to have had the most grounds for doing so.

Lannes' army was too battered to take advantage of this retirement and he himself was wounded, so except for the capture of the point on the river, which, however, was all he had been asked to do, the battle had no results. Lannes then rejoined the Emperor and took part in the sanguinary battle of Eylau on 7th February, which was a second Pultusk on a larger scale.

In June another great fight took place, namely Friedland, on the fourteenth—the seventh anniversary of Marengo—but how few of those who had taken part in the great victory on the banks of the Bormida were present on this day. Indeed the only senior commanders who were present at both battles were Napoleon himself, Lannes, Victor, Murat and Kellerman.

Lannes commanded the centre and was fiercely attacked by the Russians towards the end of the day, the fight becoming a bayonet contest which ended in the defeat of the Russians and their retreat across the Alle.

In 1808 the point of interest in Napoleonic warfare shifted to Spain. The political aspects are dealt with elsewhere and it suffices here to say that when Lannes arrived in that country in the autumn, matters were going badly with the French. His first success was that at Tudela on the Ebro, where he deafeated the Spanish General Castanos and 45,000 men. The Spanish attack was neither very vigorous nor well sustained and the battle was never in doubt.

In this year he was created (19th March) Duc de Montebello, granted 150,000 francs and given the principality of Sieversk in the department of Kalich.

In the following January he was sent by Napoleon to command the corps investing Saragossa. This fortress had been besieged in the previous autumn but the siege had to be raised owing to Sir John Moore's adroit march on Sahagun, and since that time both Junot and Moncey had tried their hands at it without success. The

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advent of Lannes (22nd January) at once created a remarkable change. The whole French force at once woke up and on the 29th were masters of the fortifications. Then followed eighteen days fighting in the streets and underground mining without any apparent progress being made. This worked so upon the feelings of the French soldiers that they were again desirous of giving the matter up and it required all Lannes influence and powers of command to induce his troops to continue the terrible struggle. Not until February 21st did the town finally capitulate, the losses on both sides being enormous. A large part of the city, including several convents, had been destroyed by mines and countermines, the hospital and the university and about 20,000 of the inhabitants were buried beneath the ruins.

Early in 1809 Napoleon returned to France and in March ordered his armies to cross the Rhine and move against the Austrians under the Archduke Charles. Lannes was brought from Sarragossa and his corps amounted to 50,000 men. The first fight was at Ebensberg on 20th April, where the Archduke Louis was surprised and defeated and two days later the armies met at Echmühl.

A month later Napoleon having taken possession of Vienna, bridged the Danube below it at the island of Lobau, and passing his troops across formed up in line of battle between the villages of Aspern and Essling. Lannes held possession of Essling and he also commanded Bessiéres cavalry which were on his left. This command led to an unfortunate incident at the close of the first day. Lannes not being pleased with the way Bessières was handling the cavalry sent him a peremptory order which the other Marshal resented. The result was a quarrel between the two at the end of the day which was only stopped from going further by the prompt conduct of Massèna who was present. Lannes' point was that something harsh was necessary to make Bessières move, and his subsequent charge enabled him to hold Essling whereas the French had been driven from Aspern. He carried his grievance to Napoleon who severely reprimanded Bessières. De Marbot says that there had always been a coolness between the two owing to Bessières having helped Murat to marry Caroline Bonaparte—a lady upon whom Lannes had apparently set his affections at the time. That was, however, nine years previously, and as at this time Lannes was a married man with five children one would have thought that the sore might have been healed, especially as the then Grand Duchess of Berg was not likely to have filled his ideal of a perfect woman.

Supposing Lannes to have been in the right, his language to Bessières next day when giving his orders left much to be desired and it is unfortunate that this incident, and its accompanying want of generosity to a beaten rival should have occurred at the very end of such a brilliant career.

A few hours later whilst sitting at the edge of a dyke watching the battle a cannon ball ricocheted off the ground and struck him on the knees, smashing one and tearing the back muscles of the other. He was carried over to Lobau where one leg was amputated.

Napoleon on hearing of the mishap came to visit him at the

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earliest opportunity and tried to cheer him, saying he would soon be better. Lannes reply was characteristic. " Sire if by doing so I can serve you and France, I hope I shall." It has been handed down that Lannes went on to upbraid Napoleon for his delight in war, and beseeched him to use his efforts for peace in the future. De Marbot who says he was present all the time denies this, but Lanfrey who supports the story says that Lannes being a republican was averse to the assumption of Imperial power. Jean Lannes the humble soldier of fortune in the Pyrenees may have been a republican, Marshal Lannes, Duc de Montebello, Seigneur de Sievers, "the Orlando of the army," and the friend of the Emperor certainly was not, so probably de Marbot's story is the more correct.

He was taken to Vienna where he died at dawn on the 31st May. " What a loss to me and to France " were Napoleon's words gazing at his dead friend and the words might have been repeated by every soldier in the army.

Years after the ci-devant Emperor enlarged his remark. "The talent of Lannes," he said to O'Meara, "was equal to his bravery. He was at once the Roland of the army and a giant in capacity . . . . as a general he was greatly superior to either Moreau or Soult."

Higher praise than this could scarcely have been given.

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Fighting Guns Landwards.

By MAJOR C. R. BUCKLE, D.S.O., R.G.A.

IN an interesting article on "Our Siege Artillery" in the February number of "The Journal," Colonel Simpson urges the importance of training at least 25 Coast Defence Companies R.G.A. in Siege Train work with a view to manning the 148 pieces which we shall require if we ever attack a modern fortress.

There are, I venture to suggest, additional reasons why we should give the whole of our Garrison Artillery such a training as will fit them to fight "landwards" as well as "seawards."

It is one of the latest theories on the defence and attack of harbours that the hostile ships will not waste their limited supply of ammunition in attempting to silence the guns of a fortress, but, if they attack at all, will concentrate their fire on warships in the harbour, the docks, and important workshops.

The attack on Port Arthur supports this theory. On one occasion only, viz. the 9th February, 1904, did the Japanese risk their war ships within effective range of the guns of the fortress, and on that occasion they did not come nearer than 10,000 yards. This applies in a special degree to the British nation. So long as our Navy is more powerful than that of any combination which is likely to be formed against us, it is improbable that an attack will be made from the sea on our coast fortresses *provided that they are defended by an adequate armament fully manned by a thoroughly efficient personnel.*

But every fortress has its land front. Just as our all powerful fleet makes a serious attack from the sea improbable, so our comparatively small army makes an attack from the land the more likely, especially in the case of our fortresses abroad. Instead of sending our gunners to sea and handing over our coast defences to the navy as advocated by a certain school of thought, our endeavour should be to turn the attention of our coast defence troops to the land side of their fortress.

The Siege of Port Arthur was no exception to the rule that a well defended fortress only falls to a combined attack from land and sea. In the event of a war in which the Garrison Artillery can take part, for every round we fire *seawards* we shall probably fire 50 *landwards*

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In our next war we may have to fall back on Coast Defence Artillery Units to provide the personnel for Heavy Batteries in additional to the present authorized establishment, and for heavy guns on the lines of communication as was found to be necessary in South Africa.

That the guns of the movable armament will as a rule be engaged landwards goes without saying, but the probability, or one might say possibility, of guns of the fixed armament of a fortress being also as a rule engaged *landwards* does not appear hitherto in my opinion to have received sufficient practical attention. Units of the Garrison Artillery allotted to the fixed armament have become so accustomed to fight their guns by means of instruments the accuracy of which depends upon their height above the sea level, that they may lose sight of the fact that guns may be fought by any means other than by position finder, depression range finder, or automatic sights. Every modern gun of the fixed armament has practically an all round arc of fire, therefore, it is possible for every modern gun (unless the emplacement be on the side of a steep hill) to bring fire to bear on a target anywhere within range of the gun, (provided that the target is not protected by a covering mass the slope of which is steeper than the angle of descent of the projectile). With possibly a few exceptions, every gun in a fortress (light Q.F. guns of the anti-torpedo boat defences excepted) can be used over the land front.

I should like to see discussion on the best method of organising our existing defences, and training our men for fighting *landwards*; for without organisation and training, we are as powerless to deal with a concealed battery on the land front, as we were powerless 18 years ago to deal with a ship steaming 10 knots.

When we begin to consider the subject we find that the system of fighting guns landwards is very much the same for all pieces, whether they be heavy or medium guns of the fixed armament, or heavy or light guns or howitzers of the movable armament. The system is in most of its details somewhat different to that to which our coast defence units are at present trained. When firing landwards we notice:—

(a) The Artillery Commander in order to concentrate the fire of his batteries on a concealed target cannot make use of the Square System quite in the same manner as when firing seawards. An amplification of the Square System is necessary.

(b) Ranging for the length if fuze is one of the most important details.

(c) Fire will as a rule be against concealed targets, therefore, clinometer elevation will be necessary. Laying for direction must be by aiming point, aiming posts or training arc. Our layers must, therefore, be trained accordingly, and be accustomed to lay on natural objects which are not as clearly defined as the bow water line.

(d) Searching and sweeping fire may have to be employed.

(c) Ranging will have to be carried out over undulating country which is a very different thing to ranging seawards.

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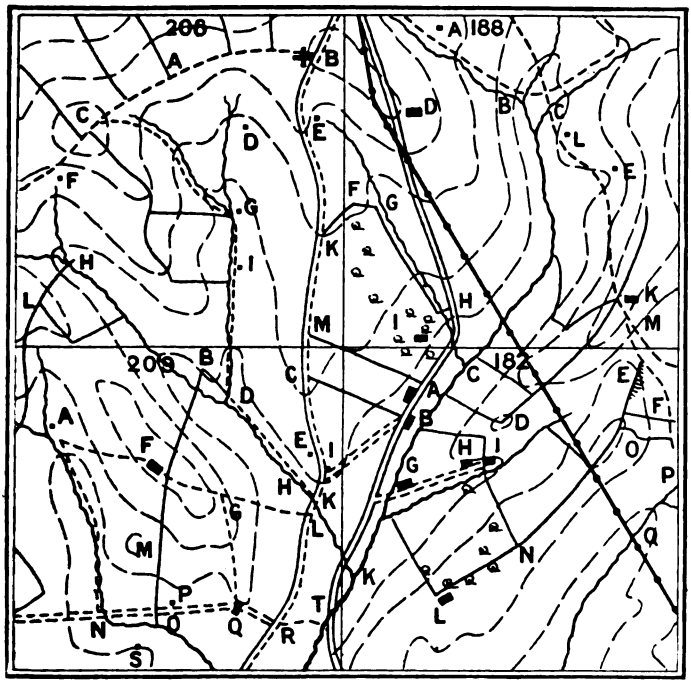
We will now consider what arrangements we can make to train our Coast Defence Artillery in the above duties, if possible without incurring any additional expense to the public.

(a) It would at first sight appear somewhat difficult to give sufficient information to the Battery Commander to enable him to bring fire to bear on a concealed target the position of which can be pointed out to him on a map but which is not visible from any observing point in communication with the battery. But here the artillery of a fortress has an advantage over the artillery of the field army; for the former is able in time of peace to prepare maps of the country over which the fighting will be done in such a manner as will give them the information they require.

One method of making such a map is as follows. Take a map (3 inches to one mile is a convenient scale) embracing all the country within range of the guns of the fortress, i.e. about 14,000 yards for the heavy guns of the fixed armament. Divide this map into squares of 1,000 yards side. Number the squares in any convenient manner, the right hand vertical column might run from 1 to 20, the next column 21 to 40 and so on. Make a careful reconnaissance of the ground, square by square, and mark on the map the position of every point which can be identified on the ground as well as on the map.



* Square should read 189.

Such points might be the junctions of roads or streams, buildings, peculiar well defined trees, conspicuous rocks or patches of ground, angles made by fences or sides of a wood, bridges, gates, &c., and to

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each of these points assign a letter. The position of the target will be described with reference to these points. A fighting order might be worded thus, "engage battery 4 guns on track 189 G. 189 H." When selecting your points remember the uses to which they are to be put, viz, as points which can be identified, either from some observing station in communication with the guns of the defence (such observing station may be on the top of a hill or in a balloon), or by scouts sent out at night. Particular attention should be given to ground which is hidden from the gun positions. Points which will be suitable as ranging points should be carefully noted.

A schedule of these points should be made giving:—

(1) Such a description of each as will assist in its identification.

(2) The range and training to the point from the battery for which the map is constructed.

(3). Information as to whether the point is visible from the battery.

(4) The observation stations from which the point can be seen.

In the example below 4 squares are shewn, viz:— Nos. 188, 189, 208, 209. The schedule is that for the points in square No. 188.

Square.	Point.	Description of Point.	From Z battery.		Visible from observing station.	
			Range Yards.	Training Degrees.	Z.	Y.
188	A.	2 stones marking source of stream N.E. of track.	7300	32	Yes	No
	B.	Track from cross roads at 187 D. crosses stream. 4 tracks meet 40 yards East of this point.	7050	31½	No	No
	C.	Track crosses stream.	7020	31	No	No
	D.	White house 30 yards East of road, there is a white walled enclosure at North end and square of cultivated land on East side. Very clearly defined. *Good ranging point.*	7100	33	Yes	Yes
	E.	Rough rocky patch East of track.	6820	29½	Yes	No
	F.	Angle in fence N. corner of SAMUELS FARM enclosure. This enclosure is fenced.	6800	34½	Yes	Yes
	G.	N.E. corner of SAMUELS FARM enclosure, South of this poiht, stream and fence run side by side.	6750	34	Yes	Yes
	H.	E. corner of SAMUELS FARM enclosure.	6530	33½	Yes	Yes
	I.	SAMUELS FARM white building surrounded by trees.	6400	34	Yes	Yes
	K.	Ruins of barn on a ridge East of track. A fence with cultivated land on each side runs along the ridge West of K to 189 D and thence into the valley at 189 I.	6500	29½	Yes	Yes
	L.	Rocky spot on track; ground drops suddenly from S. to N.	6950	31	Yes	Yes
	M.	Junction of tracks, *good ranging point*	6350	29½	Yes	Yes

Every artillery officer in the fortress should with the aid of this map of the schedule of points make a careful study of the ground so that he can readily recognise every point from his battery or from the observing station from which it can be seen:— a casual ride over the country is not sufficient, two or three hours must be devoted to each square; the probable positions for the enemy's artillery must be carefully noted, the features best suited as ranging points when firing on guns in concealed positions selected, and the difficulties which are likely to occur when ranging on these points thoroughly grasped. The coast defence artilleryman, when he has to engage the enemy in the vicinity of his own fortress, should be so

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well acquainted with the ground, that he knows every hollow and false ridge which may hide the burst of his shell; in fact he should be in the position of an officer who, before carrying out peace practice, has ridden down the range and studied the exact position of the targets and ground in their vicinity.

A map prepared as described above has the following advantages:—

(1) It provides the Artillery Commander with an accurate and simple means of indicating the objective to his batteries. The message "engage 4 gun battery on track 189 G. 189 H." will be easily understood.

(2) The approximate range can be measured off the map.

(3) When engaging a concealed target which is visible from an observing station, the approximate range and bearing can be obtained from the map.

(4) It is possible to engage a concealed target which has been located by scouts but which cannot be seen from any observing station. The best method of doing this appears to be to range on the nearest visible point to the target, and to ascertain from the map the difference between the distance to the ranging point and to the target. The necessary correction for line can also be obtained from the map. This method also will probably be the best to adopt when a balloon or kite is the only possible means of observing the fire.

(b) RANGING. The method of ranging without a range finder using sights or clinometer can be taught with 1″ aiming rifles fired at a stationary or drifting target. Every Battery Commander should also be exercised in ranging for length of fuze with a gun of small calibre, that which fires the cheapest shrapnel shell being selected.

(c) Layers should be exercised in laying on natural objects on the land front with open sights, telescopic sights and clinometer.

(d) The method of "searching and sweeping" should be practised and the batteries should also be exercised in " distribution of fire."

(e) At the majority of our fortresses it is impossible to obtain a suitable land range on which to train officers in the observation of fire over undulating country. The elementary principles of ranging can be taught when firing seawards or over a flat range such as Lydd; but thorough instruction in the observation of fire can only be taught on ground such as that over which Horse, Field, and Heavy batteries carry out their practice. Officers of coast defence units should periodically attend the practice of Horse, Field, or Heavy batteries, or should be put through an "observation of fire" course at one of the practice camps. A portion of the annual training grant could be usefully expended on such instruction. Garrison Artillery Officers from stations abroad, where no suitable land ranges exist, should be encouraged to attend these practice camps. Their travelling expenses from their residence at home to the practice camp might well be charged against the training grant of the Command to which they belong.

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In conclusion I would urge the necessity for officers of all arms of a coast defence fortress making themselves thoroughly acquainted from a military point of view with the country in the vicinity of their station. A move in the right direction has been made by the institution of Staff Rides in the neighbourhood of some fortresses, but much more can be done.

All War Games should be played on the map of the country adjoining each particular fortress. The majority of the winter exercises should be based on the attack and defence of the fortress. By this means we not only make the War Games and Winter Schemes more interesting, but we encourage officers to study tactically the ground over which they may possibly have to fight. Our endeavour should be to so train our minds that we always regard the country which we are looking at as a future battlefield; so that, in all our recreation, whether it be hunting, shooting, riding, cycling, or walking, we are making ourselves better soldiers not only physically, but also mentally.

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A Field Scale for Indirect Fire.

By CAPTAIN H. W. HILL, R.F.A.

DURING the last few years increased attention has been directed to the question of indirect fire and the establishment of lines of fire from a flank for mobile artillery. In addition to the plotter, various instruments have been devised to assist in the solution of these artillery problems, notably Colonel Prinsep's Artillery Slide Rule described in the "R.A. Journal" for December, 1906.

At present indirect fire is frequently employed for H. & F. Artillery using an observing party who are in many cases over 1,000 yards away. This method is in many ways unsatisfactory as it prevents the Battery Commander from rapidly giving effect to orders from higher authority, or in the case of a sudden advance, deprives the battery of the services of an officer and range-takers when their services are most required.

As a further aid to the solution of the problem, I have designed a Field Scale the principle object of which is to permit of the use of an Aiming Point close at hand. This scale is used to the best advantage when the B.C's director, which should be set up from 400 to 600 yards to a flank, is used as an aiming point. The battery angle for all guns and the displacement is found by the scale, thus, by means of two orders the lines of fire for the battery are established.

Description:—

The scale which is about nine inches long and about three inches wide has a black scale C (marked BASE IN YARDS) graduated to read from 50 to 1,000 yards, and a lower sliding scale D (marked RANGE IN YARDS) reading from 300 to 10,000 yards.

At the bottom edge of the slider a black arrow marked APEX ANGLE is used for reading the black scale E. This scale of apex angles is graduated in degrees and half degrees reading from 1 to 12 degrees. Above the scale C a line of black figures A read from 5 to 90, this is a sine scale, and is used for finding the True Base (T.B.). Below these black figures there is a scale B of cosines in red, marked BATTERY ANGLE. On the slider a red arrow marked DISPLACEMENT OUTWARDS is used for reading the lower red displacement scale F; this scale reads from 5 minutes to 2 degrees.

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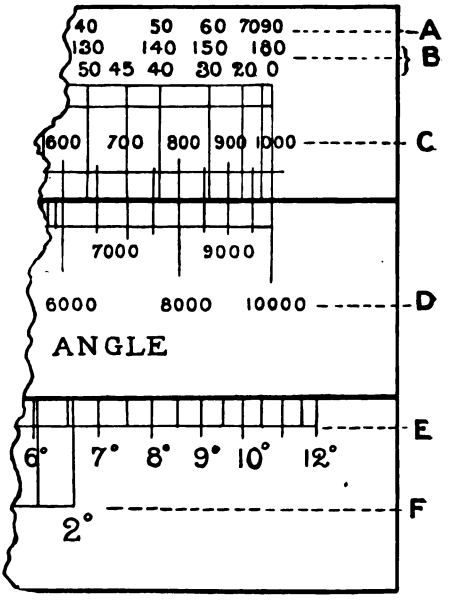
The Field Scale has a zylonite back on which there are various scales, one scale 3 inches long showing inches and tenths of an inch, another scale of 1 inch to 1 mile reading to 10,000 yards, also a detachable deflection scale for reading angles up to 14 degrees when held at arm's length. The deflection scale shown in the diagram is true for a 26 inch radius, it can be replaced by deflection scales of other radii to suit different lengths of arm. The degrees are notched and the woodwork beneath is blackened, this allows the scale to be easily read and avoids the inconvenience of projections.



The various preliminary arrangements which the B.C. has to make, and the necessary orders (taken from the latest amendments (1907) to F.A.T.) are shortly summarised and recorded on the back of the Scale.

A general service triangle is also shewn with the position of T (the target) indicated.

Method of use:—

The scale is used in conjunction with the director and the range takers. To find the apex angle OTB, the first requirement is to find the length of the perpendicular base OX (see fig. 1.)

1. To find the true base OX.

The director is set up with the base plate clamped at 180, and the zero towards the target. The angle to the nearest gun B is measured; the angle shewn by the director is TOB^1 which is equal to (180 − TOB). The range of OB having been taken, set the scale so that the range OB in yards on scale D is beneath the black 90 of the T.B. scale; then beneath the black figure equal to $TOB^1 - 5$, the true base is read off.

NOTE.—It will generally be found convenient to use ten times the range OB, thus finding ten times the value OX. This often saves pulling the slider far out, and enables results to be read with greater ease and accuracy.

2. To find the apex angle.

Set the true base on scale C over the range to OT in yards on scale D; the black arrow will now indicate the apex angle. The battery angle is TOB^1 minus this apex angle.

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The order can now be given, "Aiming Point, the director. All guns . . . degrees, left (or right)."
The gun B has the correct line of fire; it is necessary to give displacement to the other guns.

3. To find the displacement.

Set the range OB in yards on scale D under the red Battery Angle on scale F. The red arrow now points to the necessary displacement which is marked in red on scale F. If the battery angle is under 90 the displacement is outwards, for angles over 90 displacement inwards is given.

The order is now given, "Displacement . . . degrees . . minutes outwards (or inwards), from No. 1 gun," (or from gun B for which the angle TOB is true).

4. To find the range from battery to target.

Set the range OT on scale D, below the battery angle on the top black sine scale (A); the range BT on scale D can be read off below the angle TOB^1 on the same scale (A).

The angle $180-TOB^1$ is used if TOB^1 is over 90.

5. To find the angle of sight.

The angle of sight for the battery can be found by using the method suggested by Colonel Prinsep. Set the black arrow over the angle of sight from the battery to observing station on the scale E, then above the range in yards of OB the difference of altitude in yards is read off; the difference in altitude between the observing station and the target is next found in the same manner. The sum (or difference where an angle of depression occurs) of these two altitudes is the difference in level in yards between the battery and target; this scale is now set with this difference on scale C over the range BT, the angle of sight is indicated by the black arrow.

NOTE.—With bases of from 300 to 700 yards, it is more convenient to use the figures 3,000 and 7,000 and then divide the numbers above them by ten.

6. A Switch.

It will generally be found convenient to record in pencil on the triangle at the back of the scale the positions of O & B, the ranges OB & OT, also the angle TOB^1 and the battery angle as they are ascertained; this procedure makes a switch very easy. The new battery angle, which is worked out as before after finding OX^1 and the new apex angle, is also pencilled in. It is then apparent that the switch angle is the difference of the two battery angles, and it can be seen at a glance whether the switch is to the right or left.

NOTE.—If the battery had got its lines of fire in the first instance without using the B.C's director as an A.P. and the B.C. wishes to give a switch to a new target, the angle subtended by the old target—gun—B.C's director is measured by the goniometric sight of the nearest gun and signalled to the B.C. This angle is equivalent to the first battery angle and the switch can be worked out as shewn above.

7. To use a distant Aiming Point.

The two angles target—battery—observing station, and aiming

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point—battery—observing station are worked out as shewn in 1 and 2; the battery angle is the difference between the two, by pencilling in these angles on the back of the scale the direction of the switch can be seen.[1] The necessary displacement is found by setting the range from the battery to the A.P. under the red battery angle and reading the lower red scale as in 3. If it is desired to switch on to a new target T, the new angle TBO is worked out by the scale and pencilled in on the triangle at the back; the difference of the angles TBO and (A.P.)BO is the new battery angle. No change is required in the displacement.

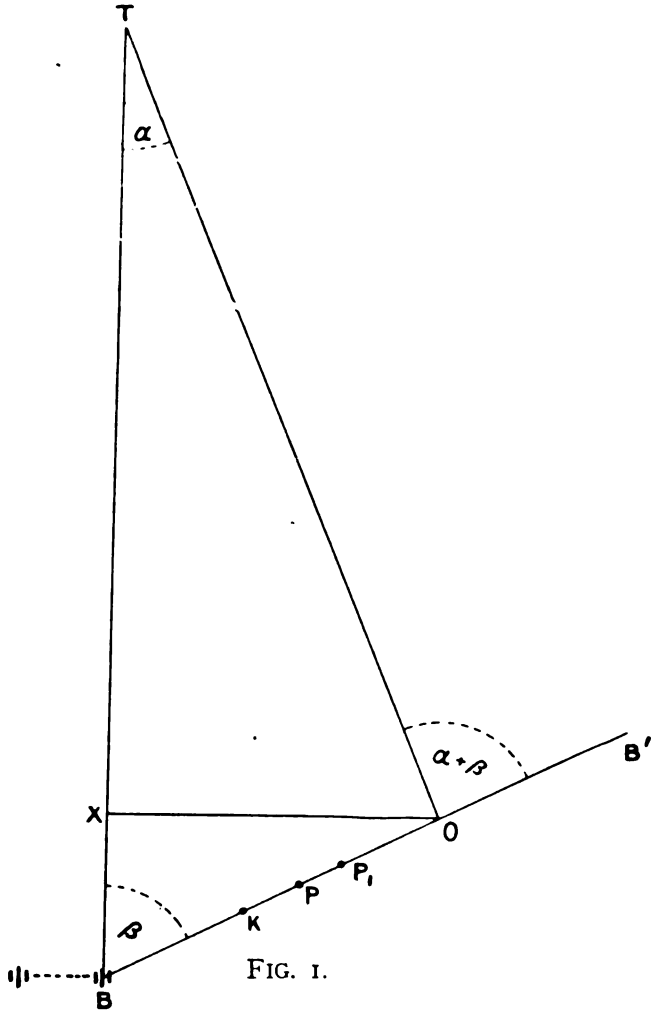

FIG. 1.

[1] If the A.P. is in rear of the battery, the two apex angles OTB and O(AP)B should be worked out as shewn in 1 and 2, the angle TO(AP) is then measured by means of the director. The battery angle is the sum of the angles TO(AP), OTB, and O(AP)B, and is to the right if the position of O is to the right of the battery.

If the battery angle amounts to over 180 degrees and is to the right, give as battery angle the angle 360 degrees minus the battery angle, Left.

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8. To converge the fire of the battery.

Set the battery range on scale D below the 100 figure on scale C. The apex angle to which the black arrow points divided by 5 is the necessary displacement which should be given inwards.

9. To find the battery angle when the battery which is about 700 yards away from the observing station cannot be seen owing to the formation of the ground.

Plant a banderole at K (see Fig. 1); the banderole should be clearly visible from the battery, if possible over 300 yards from it, and roughly in line with the intended position of O; aiming posts (P, P^1, P^2 . . .) are then planted in continuation of the line BK, the last aiming points should be visible from O. The director is set up in prolongation of the line of aiming posts, and the battery angle determined by the methods previously described.

The range to OB is of course the sum of the ranges OK and KB. No allowance for the shortening of the range OB caused by a steep slope should be made. If the total slope from O to B is as much as 10 degrees, the difference will only amount to about 1½ per cent of the range OB, that is to say a difference of 10 yards in the range of a 700 yard base.

The banderole is used as an aiming point, the displacement for battery to the banderole being used in place of the range OB.

The angle of sight for the battery which in this case is

$$\frac{BK \times a + KO \times b + OT \times c,}{BT}$$

a, b, and c are the angles of sight for the distances where BK, KO and OT is soon found by the scale.

The scale can, on certain occasions, be used as a range finder; suppose an artillery target is to be engaged, and its width as measured by the director is 1½ degrees. Set the black arrow at the apex angle 1½ degrees, and read the range (on scale D), which is below the 100 figure on scale C; the width of a 6 gun target being probably 100 yards, the range, which in this case is shewn as 3,800 yards, will be a fair approximation.

The range of the Base OB can be found accurately by means of the scale; to do this, the angle between two men in the battery who have been placed 50 yards apart along a line at right angles to the line director—battery is measured by the director. The black arrow is set to this angle and the range OB which is under the 50 of scale C is read off on scale D.

It will be seen that the uses to which the scale can be applied are manifold. The first four methods given are the standard ways of using the scale, the other ways are merely variations on the first four.

The scale is also useful in military sketching, since the height of all points above a datum level can be ascertained by finding the difference of altitude in the manner shewn in method 5.

The Field Scale readily solves nearly every artillery problem on the laying out of lines of fire in the field when using a short base.

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The proper procedure to adopt is usually apparent after the general positions of the battery, observing station, and aiming point have been roughly pencilled in on the back of the scale.

A Numerical example:—

Observing station on the right of the battery.

$TOB^1 = 68°$ (found by director).

$OB = 550$ yards (found by range finder).

(1). Hence by 1st method, $OX = 490$ yards.

$OT = 3{,}200$ yards (found by range finders).

(2). Therefore, Apex Angle $= \frac{490}{3200} = 8°\ 50'$,—call it $9°$.

(NOTE.—Read apex angles to the nearest half degree).

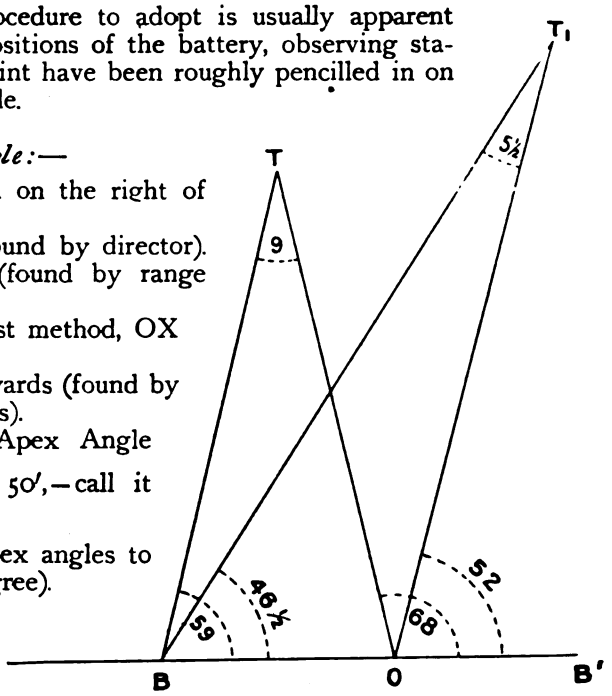

Fig for Numerical Example

Battery angle $= 68° - 9° = 59°$.

(3). Displacement $= \frac{59°\ (\text{red})}{550} = 1°\ 3'$ outwards.

NOTE.—By giving rather less than the calculated displacement, the outer flank gun will often be prevented from being just off the target; therefore, as a general rule read to the nearest five minutes below the calculated displacement.

The displacement ordered in this case should, therefore, be 1 degree outwards.

By (4). The range BT is found by the 4th method to be 3,500 yards.

These four calculations are easily done in less than two minutes, and with practice can be done in under one minute.

A new target T^1 appears.

The new angle $T^1OB^1 = 52°$, and $OT^1 = 4{,}350$ yards.

By (1). $OX^1 = 410$ yards.

By (2). New apex angle $= \frac{410}{4350} = 5\frac{1}{2}°$.

By (6). The new battery angle is $52° - 5\frac{1}{2}° = 46\frac{1}{2}°$, this angle when drawn in on the triangle at the back of the scale shows that the switch is $59° - 46\frac{1}{2}° = 12\frac{1}{2}°$, and to the Right.

By (4). The new range is found as 4,750 yards.

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This latter range when calculated by logarithms is found to be 4,725 yards, and this the scale will undoubtedly give if considerable trouble is taken in the reading, but as the accuracy of this range depends on the accuracy with which the range takers have taken the two previous ranges OB and OT^1, and also on the accuracy with which the angle T^1OB^1 is read, bearing in mind also that a 300 yard bracket will be ordered, it is clearly a waste of time to endeavour to read the scale too finely.

The trigonometrical basis of the scale.

In figure 1, it is clear that OX, which is drawn at right angles to TB, is equal to OB sin β, and that the angle TOB^1 is equal to the sum of the angles α and β, where α and β are respectively the apex and battery angles.

In calculating OX, an approximation is taken to the battery angle by using as the battery angle, $TOB^1 - 5^\circ$. It will be found in nearly all cases that this approximation is quite accurate enough to allow of the apex angle being found within half a degree and usually within 5 or 10 minutes.

To show that this is sufficiently accurate a case will be taken where an error of 10% is made in estimating the battery angle.

Range of OB = 400 yards.

True battery angle 60°; estimated as 70° in error.

OX in one case is 345 yards, and in the other 375 yards, giving apex angles of $6^\circ\ 35'$ and $7^\circ\ 10'$.

These apex angles would be taken as $6^\circ\ 30'$ and 7°,—a difference of only half a degree.

It is, however, a matter of great difficulty to make an error of 10° in estimating the battery angle.

The Field Scale will generally determine the distance of OX to within 10 yards. OX being known, sine $\alpha = \frac{OX}{OT}$; the apex angle α being shewn on the logarithmic sine scale E.

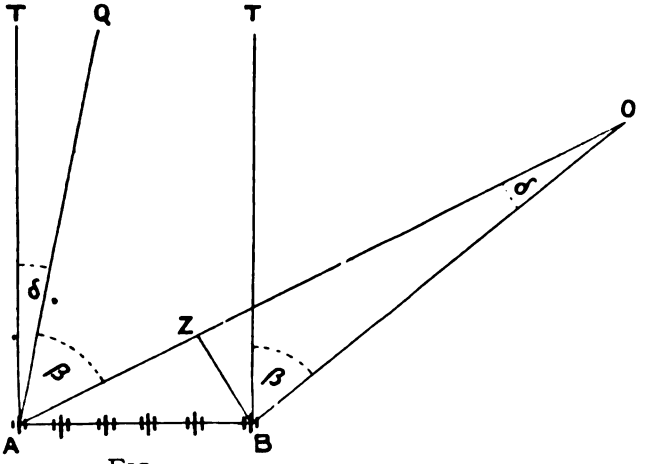

FIG. 2.

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With reference to the figure 2, the angle TBO, and QAO are each equal to β; AT and BT are parallel lines of fire at right angles to AB.

The angle OAB $= 180 - (90 + \beta) - \sigma = 90 - \beta - \sigma$; σ being the angle AOB; TAB is a right angle, therefore TAQ $= 90 - (90 - \sigma - \beta) - \beta = \sigma$, the displacement angle for outer flank gun A is therefore σ.

From B draw BZ at right angles to AO; BZ = AB, sine OAB = AB sine $(90 - \beta - \sigma) =$ AB cos $(\beta + \sigma)$. If O the aiming point is well away to a flank, the angle σ is very small and the difference in value of cos β and cos $(\beta + \sigma)$ is slight. BZ is therefore taken as AB, cos $\beta = 100$ cos β; when it is considered that AB, the frontage of the battery will seldom be exactly 100 yards in length, also that the angle ABT is not likely to be a true right angle, the approximation is fair enough.

The actual value of 1000, cosβ can be read at once, as it is the number of yards on scale C below the red β angle. The lower scale F is therefore spaced out as a logarithmic sine scale, so that when OB on scale D is placed below 1000, cos β on scale C, the red arrow points to 1/5th of the apex angle σ, thereby indicating the displacement for each gun.

A case will now be taken when the frontage of a battery is 90 yards, and the line of fire makes an angle of 80° instead of 90° with AB; taking OB = 400 yards, and a battery angle of 70°. The true displacement is found by logarithms to be 64 minutes; by using the scale and making no allowance for the above irregularities the displacement is found as 59 minutes.

The scale will, therefore, give results quite accurate enough for all likely cases.

The present Field Scale having the superimposed scales in red has been devised with the object of saving the trouble of taking out the slider and reversing it. It is quite easy to arrange it so that both the red scales are on the reverse side of the slider, thus doing away with the superimposed scales; in this case only one arrow would be shown, and that would be on the bottom portion of the scale. This change would add to the cost of production, it would also necessitate a considerable increase in the length of the scale, and have the further disadvantage of causing some of the scales to read from Right to Left. The superimposed scales are easily read after a little practice.

An attempt has been made in designing the scale to do away with as many graduations as possible so as to render the scale easy to read.

The eye soon gets accustomed to judging the correct reading when the arrow points between two graduations. After the scale has been in use a short time, no difficulty will be found in getting accurate results rapidly. The use of the scale could readily be taught to two or three men in the battery (the "look out" men for choice), and so relieve the B.C. of all trouble of working out the

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lines of fire, thereby enabling him to attend to his many other important duties when coming into action.[1]

To reduce errors in working the scale to a minimum, printed slips have been made out on the following lines:—

$$OX = \frac{TOB^1 \quad . \quad . \quad . \quad . \quad -5^\circ}{OB \quad . \quad . \quad . \quad .} =$$

$$\text{Apex angle } \alpha = \frac{OX \quad . \quad . \quad . \quad .}{OT \quad . \quad . \quad . \quad .} =$$

$$\text{Battery angle} = TOB^1 - \alpha =$$

$$\text{Displacement} = \frac{\text{Battery angle} \quad . \quad . \quad .}{OB \quad . \quad . \quad . \quad .} =$$

$$\text{Angle of sight} = \frac{. \quad . \quad . \quad . \quad + \quad . \quad . \quad . \quad .}{BT \quad . \quad . \quad . \quad .} =$$

Range BT = ...

..... (Perforations).

B.C's orders

Battery angle.

Displacement from No. gun.

Ranging Section.

Aiming point.

Distribution.

Angle of sight.

Remainder corrector.

Elevations.

The top portion of the slip would be filled in by the manipulator of the Field Scale. The slip would be handed to the B.C., who enters his orders on the lower portion; these orders are transmitted to the battery after tearing off the top portion.

The red arrow is spaced so far from the black arrow that in most cases when the scale is set only the arrow which should be used will be found on the scale. If it is also remembered that the displacement angle as found by the scale will never exceed 2°, errors due to reading the wrong arrow should be extremely rare.

To use an aiming point with the goniometric sight attached to the shield is at present a matter of considerable difficulty. With a highly trained layer it may be possible, by laying originally on the aiming point with the goniometric sight after all corrections such as displacement, &c., have been made; then after each round, turn the goniometric sight on to the aiming point, the angle through which

[1] In siege artillery about a dozen men in each company are trained to convert observers' results to battery range by means of the slide rule, and to combine the results of two observers to obtain the alteration of apex angle. See "Instructions for Practice, Siege Artillery," 1906.

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the sight has been turned is read off and put on to the traversing arc. That is to say, if the goniometric sight is found to be 2½ degrees off the aiming point to the right, set the pointer of the traversing arc to 2½ degrees right. The gun will then be on the target. This procedure would be easy, if the sight plate of the goniometric sight consisted of a bottom plate and a sighting ruler, the latter being made to move independently of the bottom plate by means of a deflection screw similar to the deflection screw head of a tangent sight. The pointer on traversing arc on the gun would then always be set to the reading shewn on the deflection leaf.

The selection of an aiming point depends to a great extent on the stability or otherwise of the guns on firing; with the 18-prs. and 13-prs. a flank aiming point is eminently suitable, as the guns soon take up a fixed position. With the 60-prs. an aiming point more to the front or far away is desirable so that the changes in displacement due to running back are minimised. It may, therefore, be convenient in the case of heavy guns to establish the line of fire by using a near aiming point as described above, and then ordering the guns to pick up and use some distant aiming point, or else employ the procedure shown in 7 above.

When the guns run back and cannot conveniently be run up, as may happen with the 60-prs., the section officer can generally correct his displacement as he knows the displacement interval and from that can estimate the difference in displacement required.

If the battery commander, before the battery comes up, marks the position of the flank gun with an aiming post, or some conspicuous object, the battery angle and displacement can be worked out by the scale before the battery arrives. When the battery leader brings up the battery he is given the slip on which are written the B.C's orders; the battery can, therefore, come into action with the least possible delay.

When without the scale, the lines of fire using a close aiming point can be established by laying the director as far to the flank of the target as the director is to the flank of the battery, the angle TOB^1 is then the battery angle. The displacement is found by measuring the angle subtended by the flank guns of the battery (see fig. 2). This angle divided by 5 is the displacement required for each gun.

The advantages of the Field Scale may be summarised as follows:—

(1). The use of the director is confined to reading one angle or at the most two.

(2). The B.C. is relieved of all calculations.

(3). Simplicity, rapidity and uniformity in orders.

In the event of a pattern of goniometric sight which is attached to the cradle being approved, the use of an aiming point to a flank will not be restricted, as at present, to the laying out of the lines of fire, and in consequence the advantages of using the Field Scale will be considerably enhanced.

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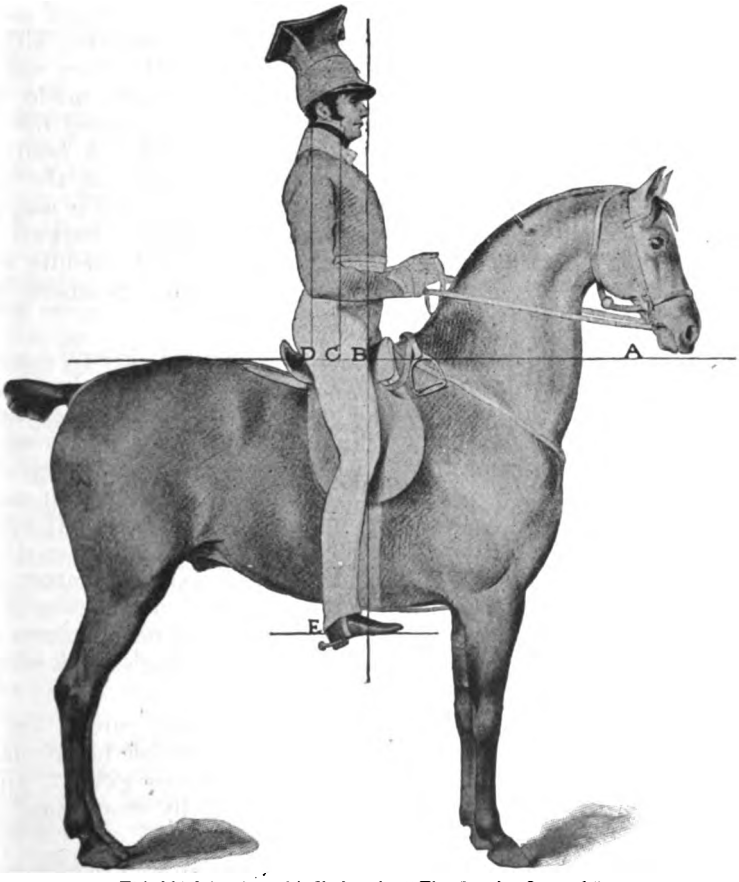
HARD MOUTHED HORSES.

By MAJOR J. F. N. BIRCH, R.H.A.

"AIDS be blowed, luff tackle would not bend the blighter!" So said the insubordinate driver to the rough-rider in the school, and he might have added: "Get up and bend him yourself." That horses in the Artillery are generally hard-mouthed no one will deny, and it may be interesting to some readers of the Journal to examine into the causes for this state of affairs, and to discuss possible modifications in our system of equitation which will tend to put an end to it. It cannot be agreeable to the horse to have his mouth gradually



(This block has been kindly lent by "The Cavalry Journal.")

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hardened into iron; he always retaliates by becoming the reverse of a pleasant mount, and often a difficult one.

The writer was lately talking over the matter with a cavalry officer who has had a life-long experience in all-round riding, and who has every right to be called an authority on the subject of equitation, and he said he considered hard mouths to be the natural outcome of a system of teaching which allowed a man to use his hand and leg on the horse before he had got his balance, and had learnt the knee and thigh grip. The writer reminded him that some years ago the "clothes-peg" seat on a horse, (see plate) or to be more accurate the clothes-peg "stand" was the order of the day. The man was balanced on his fork by the aid of his stirrups, some four holes longer than the present regulation length, and to retain the perpendicular he used the horse's mouth, nor must it be forgotten that the saddle was highly polished. Again, it was the custom always to ride on the big bit, and much emphasis was laid on the fact that the horse was to be pressed up to it. Could anybody, save the finished horseman, preserve the horse's mouth under such conditions? Good mouths were consequently the exception, a state of affairs which should now be at an end. The modern regulation seat is a natural one, although military saddles have the grave fault of not giving the rider sufficient room, and the remark of a famous master of hounds, made but a few years ago, that his son rode very well until he entered the army and passed through a cavalry riding school, would not hold good now-a-days. In our regiment, until 1904, the driver in the riding school had to hold the rein in the flat of his hand, and if it was fitted according to regulation one of two things was bound to happen when the horse jumped, either the man was pulled out of the saddle, or the horse's head was forced into a cruel and unnatural position, which seriously interfered with his performance.

Perhaps horses' mouths are as quickly spoiled driving; without care they get onesided. Senior officers of the Regiment have in the past all taken part in the customary drill order inspection on the gun park; it was a most ceremonious affair, first the number one inspected his sub-section, then came the Subaltern, who after having given the order to draw swords, repeated the process with his section and returned swords; lastly the Major went through the same performance, inspecting the whole battery. This was all very excellent in its way, but the fitting of the leading rein, the most important matter as far as the driver was concerned, was often forgotten, and it was a common thing then, as it is now, except where the new harness is in use, for the off horse to do the whole of his morning's work with the bit bearing on only one side of his mouth.

The writer of these notes has been told how careful the post boy was in the old days about the bearing on his off horse's mouth, and to this day the road coachman, now alas almost extinct, will not dream of getting on to his box without carefully examining every bit and coupling.

So much for the causes, now for the remedies, and it is as well at the outset to state that the writer is aware of all the difficulties a

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Major has to contend with in England, and is in thorough sympathy with him. The man, the horse, and the bit will be considered separately.

The recruit who is allowed to hang on by his horse's head not only ruins that horse's mouth, but renders him unfit to be used in instructing another beginner. He must be taught from the first not to hold on by the reins and should be frequently be made to drop them, the Instructor's energies being devoted to getting him balanced, and to strengthening his knee and thigh grip; this is the A.B.C. of riding and the essence of good horsemanship. Balance is simple enough to teach, but developing the thigh muscles is a branch of the art of training athletes which does not always receive the attention it deserves; it is greatly a matter of the sympathetic treatment of the individual. Many things must be taken into consideration by the Instructor; the pupil's strength and fitness, the shape and length of his thigh, his keenness and his heart. Gradually increased doses of rising in the saddle from the knee (with stirrups) after the manner of hunt-servants, and rising in the saddle without stirrups, are excellent exercises for acquiring and retaining this all-important grip, provided the pupil is not allowed to become overfatigued. When the writer of these notes again commands a battery, he will certainly have dummy horses made and set up somewhere near the stables; saddles will be placed on them and the recruits will mount them daily for a five minutes' lesson in rising, with and without stirrups and in swinging the lower part of the leg from the knee; this will take place both before and during their equitation course. Before a man learns to drive four horses it is necessary that he should strengthen the muscles of his shoulders, arms, and fingers by manipulating dummy reins with weights attached, if quick results are to be obtained when he gets on the box, and the same principle must apply to the thigh muscles of the man who is to be taught riding. The polo player not only uses the dummy pony to get his eye in, but also to strengthen his arm and wrist, and incidentally he strengthens his thighs. The recruit who has never been on a horse has probably never in his life brought into play the particular muscles used in riding, and however strong he may naturally be, what confidence can a man have who is asked to apply a new set of muscles for the first time when mounted on an animal he most likely regards with awe.

The bar on the ground, or hurdles laid flat should be successfully negotiated with reins let out to the full extent before the recruit is asked to to jump anything higher, in order that he may at once learn not to expect support from his horse's mouth. Horses will rush at this at first, but when they recover from their astonishment and find that jumping no longer involves a severe jerk in the mouth, they will soon settle down and jump temperately, especially if they are fed after the first fence or two. The writer's experience at the Riding Establishment, where there are never less than two hundred people under instruction, has convinced him that given a firm seat, bad hands are the exception. It is quite a common thing for horses to retain good mouths who are ridden by as many as fourteen different

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Fig. 1. Incorrect way of riding at jump. Arms held straight out.

Fig. 2. Result of riding at jump with straight arms. Horse receives job in mouth and lands on all fours. Rider is pulled out of saddle.

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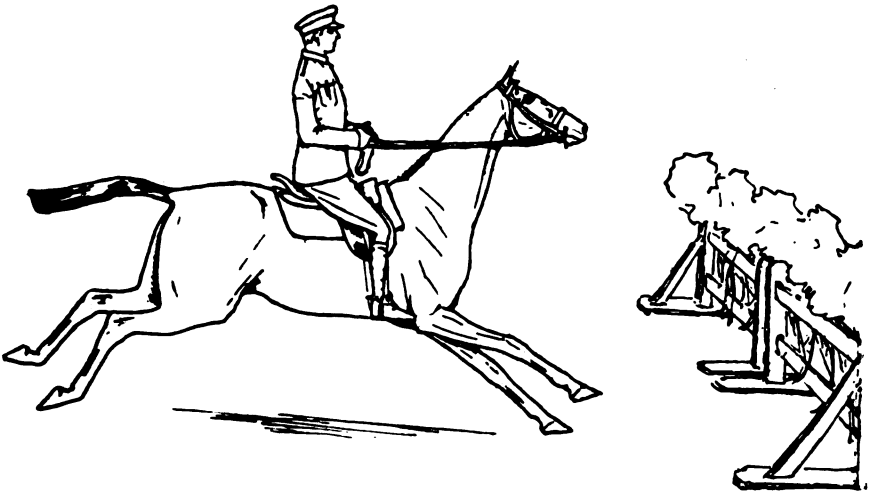

Fig. 3. Correct way of riding at jump. Elbow bent, upper part of arm hanging straight from the shoulder.

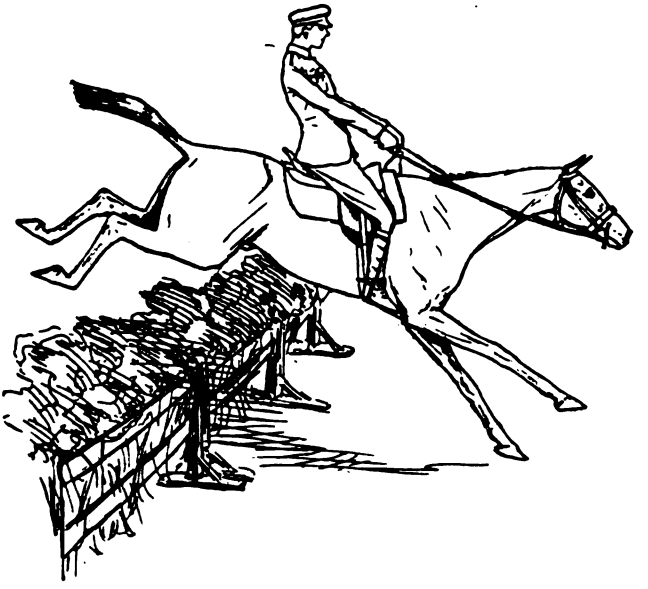

Fig. 4. Result of riding at jump with elbows bent. Rider is able by shooting out his arms to give his horse his head on landing.

men a week, some of them beginners. The accompanying illustrations by Captain G. H. A. White, R.H.A., show how necessary it is to see that the man's arms and hands are properly placed before he presents himself at the obstacle, and it is worth noting incidentally that the recruit is inclined unintentionally to shorten up his reins before his horse jumps.

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As to the horse, he must be mouthed and trained; the cavalry have done much in retaining old horses. It is hard to exaggerate the importance of long rein driving and the excellent results that can be obtained from it, not only with young ones, but with intractable horses and refusers. Three weeks' long rein driving by an expert at the commencement of a horse's education will shorten his training and save time in the end; all rough-riders are thoroughly grounded in this at the Establishment.

Bad mouthed horses can be improved by being ridden by good horsemen, and if the man is not taught on joining to hang on by the reins, there should not be so many bad mouthed animals to deal with in the future. France and Germany do not suffer from them as we do, most of their military horses are fit for anybody to ride; how many horses in an English battery, putting aside draught horses, are suitable mounts for the Inspecting Officer or the distinguished stranger? Good manners and a bad mouth are rarely found together.

The universal bit is condemned, but it is still with us and likely to remain so.[1] After some time in wear, there is sufficient play at the spot where the cheek piece joins the mouth piece to allow of the horse's lips getting pinched, and the bit then becomes an instrument of torture and should be cast. The writer has seen a young horse rear over from pain when asked to turn suddenly with a worn bit in his mouth. Another form of cruelty is to use a universal bit a size to small for the horse's mouth. Space does not admit of the writer going fully into the many ways of treating bad mouthed horses; they can often be made to go with more comfort to themselves and their riders, always providing the latter are horsemen, but it is worth mentioning that a Mohawk bit can be improvised by tying a piece of leather across the top of the universal bit, and so bringing the pressure on to a lower part of the animal's mouth. Some horses get their tongues over the bit, which can easily be stopped. The martingale and the noseband, though sometimes necessary, are seldom used in the service, and if a horse leans on one side of the bit a cheek leather will often put a stop to it.

A horse will go twice as far on service if he has not to use his head to support his rider; he wants it for other things, and comfort and peace are as necessary to him on his travels as to a man.

So many horses in the service are exposed to cruel pain and in some cases injury to the jaw, that in the interests of humanity alone the subject merits attention.

[1] NOTE.—The new bit, which will presumably be issued when the present stock of universal bits is exhausted, will demand a higher standard of riding than the old bit and bridoon.

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Notes on recent changes in the Japanese Field Artillery Manuals (Provisional).

By CAPTAIN E. F. CALTHROP, R.F.A.
(Communicated by the War Office).

1. The changes contained in Sections 3 and 5 are translations of pamphlets issued by the Director of Military Education; they are valuable as embodying the results of the experience of the war.

Small changes in gun drill have been omitted, as they refer to the present equipment (non-quick-firing) which is shortly to be changed.

Firing regulations are issued in a separate volume, not only for infantry, but for each arm.

The Field Artillery Manuals are for field and mounted artillery; parts special to mountain artillery have been omitted.

2. The Drill Manual.

THE CHIEF ADDITIONS AND ALTERATIONS IN THE DRILL MANUAL.

Preface to pamphlet of changes:—

3. The recent war has shewn that there is no necessity to change the main principles of the F.A. Drill Manual. But regulations which detracted from simplicity, or restricted the range of practical application; instructions which were vague, or liable to be misread; points brought to light by the experience of the war that have hitherto escaped notice; changes in drill necessitated by partial alteration of *matériel*; all these have, in the light of the experience of the war, necessitated minor alterations in the drill book.

The drill manual is now divided into two parts: Part I., Fundamental training; and Part II., Fighting.

Field calls:—

9. Field calls are abolished. (Commands are given by voice or signal, preceded, if necessary, by a whistle).

12. Gunners and drivers will, as far as their several duties permit, mutually assist each other.

Foot Drill:—

14, 59. Curtailment of battery and battalion foot drill. Attainment of proficiency in this, as marching past, &c., not only takes many

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days away from field training, but it is also somewhat outside the requirements of artillery. Also, the object of foot drill being chiefly disciplinary, the same result is obtained by individual drill, or drill in ranks. Only simple movements for the battery on foot are accordingly given and sufficient instructions for the battalion to enable it to be drawn up on parade.

17. The position of attention is amended in agreement with the instructions laid down in the new infantry provisional drill.

22. In consonance with the modifications in the infantry provisional drill, a more natural step is introduced. The former step (that is when marching at attention)[1] was tiring, and took time (which could ill be spared from field training) to acquire. There is now only one method of marching in quick time.

NOTE.—There has been a marked tendency to give an exaggerated action to the step beyond the requirements of the book; this is to be guarded against in the future.

Stepping back is cancelled as an instructional or drill movement.

(Other minor changes in foot drill, contained in the revised infantry drill are omitted).

Single gun drill:—

62. Section commanders and detachments will kneel in action unless ordered to stand.

65. A cotton wool plug for the ears being used by the gunners of both field and mountain artillery in action, reference to this is now made in the general instructions.

69, 121. The detachments being nearly always dismounted when limbered up, their normal positions are laid down as on foot.

70. The positions of No. 1 and gun Nos. are between the wheels in action (not outside as heretofore) in order to gain the cover of the shield.

75. The No. 1 will distribute the cotton wool plugs to the detachment at "Prepare for action."

88. When running the gun back in action, the Nos. 4 and 5 will man the lifting handles and handspike.

Rate of fire:—

216. "Extra rapid fire" is abolished. Rates of fire are thus reduced to three:—

(1) Firing each round by order of the B.C.
(2) Ordinary fire by order of the section commander, at sufficient interval to allow the B.C. to observe who may alter the rate by giving, "Quicker!" or "Slower!"
(3) Rapid fire, by order of the No. 1 as soon as the gun is ready.

The B.C. may fix the number of rounds to be fired by each gun. A rate of over six rounds per gun per minute should be obtained at rapid fire.

[1] The German Parade Marsch.

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Battery drill:—

316. Column of sections being rarely used, movements in this formation are cancelled.[1]

As a multiplicity of movements adds unnecessarily to the task of instruction, the following movements, being rarely used in the field, are struck out:—

Advancing from the centre (battery in line) in column of route.
Forming line from column of route on either side of the leading subsection.
Coming into action front from column of route on either side of the leading subsection.

Battalion drill:—

347—349. Battalion[2] drill, except so far as it is necessary for deployment, or assembly, is cancelled, as being practically never performed in the field, and pointless on the parade ground. The whole section is remodelled. Orders to the battalion are now conveyed by order, and not by word of command.

(Small changes in gun-drill have been omitted).

PART II. FIGHTING.

Fighting:—

358. The artillery action is of a "pliable" (may be bent but not broken) nature, and as the adoption of shields by artillery has further prolonged the artillery fight, in comparison with other arms, artillery require fortitude and staying power. Every endeavour should be made in peace time to cultivate these qualities.

359. The statement that artillery open an action at *long* range is cancelled. It is unnecessary, since it is the natural rôle of artillery, and also a statement liable to misconstruction.

If means of communication (as telephone, &c.) exist, an increased interval between batteries is no longer a disadvantage, and at the same time the chances of loss are diminished. The statement that the batteries of a command should not be separated is, therefore, cancelled.

360. Special circumstances, other than the decisive attack, may require the advance of the artillery into the zone of effective rifle fire.

361. It is the duty of neighbouring troops to protect its artillery that is threatened by the enemy. This is amended to read:—"Neighbouring troops will protect its artillery, &c. . ."

362. "Laying will usually be direct unless the situation and ground compel the occupation of an entirely covered position when laying will be by the indirect method." The word "allow" is substituted for "compel" and "entirely" is cancelled. This alteration is however on no account to be taken to imply that indirect laying is recommended.

[1] The formations of a field battery now are:—Line twenty two paces interval between sub-sections (close order, five paces), wagons in column of route in rear of right sub-section, and column of route, five paces distant between carriages.

[2] An artillery battalion consists of three batteries.

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Added:—

365. When firing *at night or* over the heads of friendly troops every care must be taken not to inflict damage on our own men.

Control:

367. This paragraph is rewritten—the meaning, however, remains unchanged: "When an action is contemplated, the commander of the force will direct the C.R.A., as to the object in view, the position, and the moment for its occupation; also the target on which the fire should be mainly directed.

370. Additional stress is laid on the necessity for rapid and reliable means of communication (as telephone, orderlies, &c.).

Artillery patrols. See Appendix 371. New:—

371. Patrols will be sent out by the C.R.A. to maintain touch with the Headquarter Staff of the force and neighbouring bodies. (New).

376. The necessity of keeping the artillery informed of the position of the infantry's advance and of the moment when the assault is to be made requiring means of communication, patrols will be attached to the infantry line for this purpose: usually by O.C's battalions.

Selection of the position:—

379. The features that a position should possess are rewritten as follows:—

"1. An unrestricted view of the ground and of the target.
2. Broad and open field of fire with ability to sweep ground at close range.
3. Position for the guns as near as possible at right angles to the line of fire.
4. Command.
5. Breadth.
6. Flat and firm platform for the guns and an uninterrupted view inside the position.
7. Facilities for advance or retirement.

New:—

8. *A place suitable for observation* (or fire).
9. A suitable position for the wagon line."

380. Rewritten as follows:—"A position in rear of a crest which just admits of laying with open sights, makes it difficult for the enemy to observe; a position in rear of cover, natural or artificial, gives invisibility; a position in front of dark objects, as woods, &c., is difficult for the enemy to pick up; soft or broken ground in front of a position while it should not be such as to interfere with our movement, renders the enemy's observation difficult, and diminishes the effect of his fire."

381. Direct laying being necessary against a moving target, "When occupying a covered position, preparations should be made to enable direct position to be taken up close by," should a moving target offer itself.

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383. The intervals between guns in action depend entirely on the ground; owing to frequent misinterpretations of the old regulations, this paragraph is amended to read: (See Appendix 191). "The minimum interval between the guns is ten paces, but this should be increased if possible; further, if the ground prevents it, a uniform interval need not be maintained. Intervals between batteries should be over thirty paces, but to obtain this the gun intervals must not be diminished" (also see paragraph 359).

Reconnoitring and taking up a position:—

389. In taking up a position it may be necessary for the regimental commander to indicate the degree of cover to each battalion, as this is often not uniformly arranged between battalion commanders.

393. In a retreat, as it is essential for the commander to keep his command in hand, he will not go forward himself to reconnoitre the position, but send one of his officers with the necessary instructions.

New:—

394. "The occupation of a position at night being especially liable to confusion and error, as far as possible, reconnaissance and arrangements to the smallest particular will be made in daylight." Experience has frequently demonstrated the importance of this.

399. "Advance into a position under fire may be advantageously made in line; or reasons of ground, or cover, may render column of route more suitable for a battery coming into action; *(New:—) further, in order to escape observation or diminish possible loss, the distances between carriages may be increased and guns brought into action in succession.*" The value of the last method has frequently been demonstrated.

Fire control:—

405. "The enemy's Headquarter staff, balloons, *observing stations, machine guns and searchlights* are suitable targets for artillery. *Against shielded guns or an enemy under cover, little effect will be obtained except from oblique fire.*"

New:—

406. The necessity for night firing being established, this paragraph is now added:—"Night firing being necessary to repel an enemy's attack, to threaten him, or disturb his camp, or to raise the spirits of our own troops, preparations for action must be made by the artillery before dusk."

New:—

408. "*A slow fire should be maintained on hostile artillery that have been temporarily silenced, in order that he should not recruit his fighting power.*" This has been found a necessary measure.

413. The economical use of ammunition being a vital necessity, to the occasions when the rate of fire should be increased is now added a reminder when the rate of fire may be reduced.

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414. Owing to the improvement in the time fuze, time shrapnel can now be used up to the same ranges as percussion shrapnel, and the paragraph laying down common shell for targets outside the range of time shell is, therefore, cancelled.

Change of position:—

417. The necessity for loading before changing position being dependent on the situation, it is now made optional.

Conduct of the wagon line:—

422. To avoid disputes between batteries, the battalion commander will usually point out the positions for the wagon lines when there are several batteries.

423. As the distance between the wagon line and the guns depends on situation, a distance of 300 metres is no longer laid down.

425. The above remarks apply to the limbers and horses of the firing battery. It is also added that while these may be separated from the wagon line in action they should not be farther to the rear than the latter.

427. The distance of the regimental wagons from the guns is no longer laid down at 600 metres, for reasons as above. Their division into two sections, advanced and rear, is permitted as facilitating ammunition supply.

Ammunition renewal:—

432. The commander of the wagons with the guns will inform the B.C. when about half the ammunition with the guns has been expended. Then the B.C. will, if he considers necessary, order three ammunition wagons from the wagon line, and report his action to the battalion commander. The wagons will come up together, or in succession, to the rear of the position. The N.C.O. in charge of them will then carry out with the O.C. wagons, the renewal, either changing wagons or ammunition boxes or bringing up the ammunition by hand.

434. The battery wagon commander will be responsible for the replenishment of his wagons from the regimental wagons. This has been found to work better than making the battalion commander responsible, as he is usually occupied with other duties.

Artillery in attack:—

443. Artillery in attack is now considered under three heads: against the enemy on the march; against the enemy already deployed; and against field works.

447. Reasons for selecting the artillery position as near as possible to the enemy are now clearly laid down. "The artillery position should be as close to the enemy as the G.O.C's intention, the situation, the ground and the weather permit, both in order to develop an effective fire and also that the enemy's position and the state of the infantry action may be accurately gauged, so as to render thorough co-operation."

448. Increased stress is laid on the necessity of developing the greatest possible volume of fire at the moment of the assault.

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449. " In order to help the infantry attack, a certain number of batteries must, at the risk of sacrifice, follow the infantry to within effective range, for a rallying point for the attacking column, and encourage their moral," a course which amply recompenses any loss. "Must" is substituted for "should" in the old book; with the purpose of obtaining direct hits, the advantage of pushing forward a small number of guns to the neighbourhood of the skirmishing line has often been felt; this is now laid down.[1]

454. A combination of shrapnel and common shell may be used against field works with advantage.

New:—

467—478. Action of artillery with independent cavalry.

SECTION 5.

ALTERATIONS IN THE FIRING REGULATIONS EMBODIED IN THE NEW PROVISIONAL HANDBOOK.

Preface to pamphlet of changes:—

As only a short time has elapsed since the publication of the last field artillery regulations,[2] the necessity for any radical changes has not yet arisen. The experience of the last war has shown, however, that certain alterations are desirable. The question of ranging with time shrapnel requires further trial before it can be laid down as a regulation procedure; reference to this is postponed accordingly.

The chief alterations are, in order, as follows:—

NOTE.—The fuze on which the instructions in this manual are based is the 18 secs. fuze.

The use of practice shells is discontinued as being unnecessary.

Owing to the adoption of the "lengthening strip" (to enable the arc sight to be used at increased ranges) instruction in its use is here laid down.

64. Selection of an aiming point, if possible, to the front or flank.

Owing to the adoption of a shield, the selection of an aiming point in front is a matter of difficulty. No particular direction is new specified.

71. The aiming post will be planted, if possible, to the front.

80. In firing at a target of which only the flash or smoke is visible, if necessary an aiming post will be planted as a guide to direction.

Generally:—

82. The battery commander will select from each year's conscripts, generally 10 (not 8) men for training as layers, and at the

[1] The para in the drill manual reads:—"For the purpose of disabling machine guns or driving enemy from behind cover, etc., it may be necessary to advance a certain number of guns to the neighbourhood of the skirmishing line."

[2] Three years and eight months. Last issue March, 1903.

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examination of layers before practice generally 15 (not 12) men who qualify will receive layers' badges.

87. Prizes will be awarded to the 5 (not 4) best layers.

89. A man awarded a laying badge when appointed N.C.O. will continue to wear it, as conducing to encourage the importance of laying.

98. Section commanders (in their sections), may often be called on to give their observations of fire.

111. Pointing out target. A sketch having frequently been used (in the late war) with excellent results in order to indicate the target, the following is added to this section:—"If the occasion permits, a plan or freehand sketch enables a target to be rapidly and accurately pointed out. It should shew our position, observing station, the position occupied by the enemy, and the places where he is likely to appear. Names, where they exist, or numbers should be affixed. Ranges and other points affecting the firing should be noted. The map will be drawn first roughly; after the artillery position has been selected, detail will be added as time allows.

115. Fire effect on *matériel* having been denoted and being likely to increase in importance, the following addition is made:—"After ranging (on *matériel*) has been completed, the most clearly visible portion of the target will be selected and fire distributed upon it.

New:—

120. This paragraph is rewritten as follows; its intention remains unaltered:—"Each gun in succession throughout the battery will be used for ranging, but if necessary *a section*, or one gun only, will be told off for the purpose."

121. Owing to the adoption of the lengthening strip fire over 6,000 metres can be made. Owing to the unavoidable errors at this range, less than 100 yards bracket cannot be laid down.

Ranging:—

122. When firing for the bracket after, at the most, three unobserved shots at the range should be changed. In order to decrease the time taken in ranging, when there is a likelihood of a shot being doubtful or difficult to observe two more shots should be fired at the same elevation.

Verifying the fuze:—

131. After the range has been established, the guns will be loaded with time shrapnel and one round or several rounds throughout the battery will be fired alternately at either end of the 100 metre bracket.

144 *et seq.* "Extra rapid fire as a special rate of fire is cancelled in consonance with the drill book."

Firing against shields:—

160. The present tendency being a general adoption of shields by artillery, the following instructions with regard to firing against shields are inserted:—

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"Time shell being most effective against *personnel*, and common or percussion shell against troops under substantial cover or material, it may be advisable for part of the battery to fire with common or percussion shrapnel and the remainder with time shell; or the bracket may be shortened and the shell burst low."

Firing at balloons:—

161. As firing at balloons is likely to be a frequent occurrence in future, this subject is now treated in detail as follows:—

Subsections will load with time shrapnel in succession and establish a 200 metres bracket by successive ½ reductions. Then, from each end of the bracket and from 50 metres on each side of the centre of the bracket the range will be established. Rapid or salvo fire will then be opened, and the height and length of the burst adjusted in the ordinary way, except that the height of burst will be adjusted by alterations in the range. Observers will be posted as far as possible to either flank to assist the B.C. in his observation.

Firing at night:—

162. Detailed instructions for firing at night are now added. Night firing was frequently practised in the late war, and is likely to occur in the future. The necessity for its inclusion here is, therefore, evident.

"Night firing may be, either practice in the day carried on after nightfall, or against targets of which only the flashes are visible, and for which all preparations have been made in daylight.

"It is of the greatest importance to have already completed ranging. Ranging on important points and arrangements for distribution should be made in daylight. If this cannot be done, lines of fire for each gun, for the observing party and for the B.C., should be laid out, ranges carefully measured, and all preparations for firing made before nightfall.

"When ranging at night, if observation is difficult, the round nearest the target about which no doubt exists should be taken as a basis and one round per battery fired at intervals of 50 or 100 yards from that. Time shrapnel will be used against troops, percussion shrapnel or common shell against villages, woods, or intrenchments."

APPENDIX.

PARAGRAPHS FROM THE DRILL MANUAL BEARING ON THE ALTERATIONS CONTAINED IN SECTION 3 FOR BRINGING OUT SPECIAL POINTS.

Strength of detachment:—

69. A gun detachment consists of a commander and five men, one of whom is at the wagon.

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A wagon detachment consists of a commander and four men. In action two men behind the wagon limber helping the number from each gun. The position of the remainder will be specially detailed. (121).

Cotton wool:—

65. To protect the ears when firing the ears of the commander and detachment will be plugged with cotton wool.

Sidearms:—

71. When mounting the gunners will turn their sidearms round to the front of the body, reversing this on dismounting.

Handspike shipped before the trail revolved:—

77. Action front. After the limber has been unhooked the trail is lowered to the ground, the handspike shipped and the brake adjusted. Then the gunners man the wheels and handspike and the gun is carried round and the trail dropped into the position indicated by the commander.

Firing battery:—

304. The firing battery consists of six guns, three ammunition wagons, and spare draught horses.

Intervals, etc.:—

191. The interval between guns in action, usually twenty-two paces, the wagon fifteen paces behind the right gun of each section facing the rear. Section commanders, seven paces in rear of the centre of a line joining the ends of the trails of their section. They are free to move about their section.

The commander of the wagons, with the wagons in action superintending the issue of ammunition.

Signals:—

306. Signals for movements will be given twice, first as a caution, the second time as an executive command.

PART II. FIGHTING.

Intrenching:—

366. As far as time permits, the position should be intrenched whatever the circumstances.

Patrols:—

Artillery patrols.

371. Before the commencement of an action and during its progress the artillery commander will send out patrols, usually officers, far to the front, to reconnoitre the ground and the enemy, also patrols to maintain communication between army headquarters and between neighbouring corps.

372. When attacking an intrenched position, while a general reconnaissance of the enemy's position will be made by the officer in

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command of the force, the artillery commander should also send officers to reconnoitre the enemy's position, the nature and position of his intrenchments, &c., both before and during an engagement.

373. In selecting a position, officers in command of artillery may send out patrols to assist them in their reconnaissance. Similarly at a change of position patrols should be sent forward to reconnoitre the new position and the way into it.

374. When taking up a position patrols will be sent forward to reconnoitre the nature of the approaches or for purposes of protection against attack or to watch a dangerous flank of ground which cannot be seen. These patrols will not act independently at a distance, but will usually remain in sight of their units.

375. When fire has been opened, brigade commanders will usually detach patrols to observe the target, ground in its vicinity and the effect of our fire upon it. If possible, the patrols will remain near their guns in a position giving facilities of observation and communication with the batteries.

376. See Section 3.

378. Although officers in command of artillery units will send out patrols for purposes of reconnaissance or protection as is necessary, they will be careful that they do not overlap. As far as is possible one patrol should fulfil several purposes. . . . Reports should be clear, trustworthy and in time. The best report, if it is late, is useless. Patrols should report important matters, although they may be outside their duties.

Selection of the position:—

385. A position on which the enemy has already ranged, or on a level with it should be avoided; but a short distance to the front or rear diminishes the effect of the enemy's fire.

Occupation of the position:—

401. To occupy a position unobserved and open an unexpected fire on the enemy is ever to be desired. But, when a portion of the artillery must expose itself, it is a mistake to cling to cover; instead we should compensate for it by rapidity of movement.

402. Choice of pace depends on the objective, situation and ground; if necessary, horseflesh should not be spared in order that an opportunity may be seized and the guns brought into position.

A fast and lively pace under the enemy's fire raises the moral of the troops; occupation of a position at the decisive moment of the fight should be made at the fastest pace.

Change of position:—

The position must not be changed unless the battle objective is promoted thereby, as it necessitates a cessation of fire.

416. Positions will not be changed without orders from the commander of the force, to whom the C.R.A. will apply for permission to do so if the occasion demands it. If, however, the situation requires instant action, the C.R.A. may order a change of position on his own responsiblity, reporting his action at the same time. Small movements by man handling are not regarded as changes of position.

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Where more than one battery is in action changes of position will usually be carried out in succession.

Wagons:—

421. 422. On the march the battery wagons (not of the firing battery) will march by battalions in the order of march of their respective batteries, the senior wagon commander in command. They will march directly in rear of the firing batteries of their battalion. On advancing into action wagons will usually separate and move in accordance with their batteries.

422. The position of the wagon line will be determined by the O.C. battery in accordance with the instructions of the battalion commander. If the wagons of several batteries are occupying the same ground the senior wagon commander present will allot the space. If the limbers and horses of the firing battery are separated from the wagon line, the wagon commander will place a N.C.O. in charge of the former.

425. If there is no cover for the horses and vehicles they will form up in column behind a flank of the battery; if there is cover, in a formation that will take best advantage of it and be suitable for an advance.

426. The regimental wagons on the march will usually be separated from the regiment and follow immediately in rear of the divisional fighting troops. If necessary the regimental wagons may be distributed to the battalions or a portion may be allotted to a single battery.

428. When the regimental wagons have taken up their positions in action the O.C. will report it to the C.R.A., regimental and brigade commanders.

Ammunition renewal:—

431. Ammunition in the limbers will only be used when there is a stoppage in the supply, or occasionally when in action for only a short time or when the B.C. considers necessary. It must be replaced as soon as possible.

433. The regimental wagons will usually not exchange horses and carriages when supplying ammunition.

435. The commander of the force will instruct the C.R.A. as to the position of the ammunition column, who will inform the O.C. regimental wagons. Requisition on the ammunition column will be made by the regimental wagon O.C., who will usually send horses and wagons to the column. A portion of the ammunition column may, however, be sent direct to the regimental wagons or to the guns.

After a battle the battery wagons will usually fill direct from the ammunition cloumns.

436. If demands on the regimental wagons are made by units other than their own they will supply them if the situation permits it.

Attack:—

446. Passage of zone swept by the enemy's fire should be performed at night and fire opened at dawn.

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450. As many guns as possible should be deployed on the captured position to destroy the remnants of the enemy's resistance. On this occasion the battery front mav be decreased so long as there is sufficient interval to work the guns.

Defence:—

460. If before the infantry assault, the artillery duel, if continued, gives no promise of results, the commander of the force may order the artillery to withdraw from under the enemy's fire. When the enemy draws near for the decisive attack the whole of the artillery will at once come out whether orders have been received or not, and, regardless of the enemy's artillery, fire on the advancing infantry. If on this occasion even one battery takes up a position different to its original one, unknown to the enemy, it is most advantageous.

461. Even should the defence fail, a portion of the artillery should endeavour to prevent the enemy's artillery from occupying the position that has been evacuated. The remainder should concentrate its fire on the enemy's infantry and, with the reserves, strive to drive the enemy from the position. The artillery should fight to the last, and so doing need not fear disgrace, even should it lose its guns.

NOTES.

The following observations are appended:—

1. General instructions for the training of the army, and courses of instruction for each arm are contained in a separate handbook. Ceremonial drill is also included in separate regulations. The style is extremely brief, and information of at all a miscellaneous character is excluded. The principal aim appears to be simplicity.
2. The division of the drill manual into two parts applies to all Japanese instruction or training: First, principles; and later, their practical application.

The principal lessons deduced from the war appear to be the following:—

(a) Necessity for closer co-operation and better communication between artillery and infantry in the attack.
(b) Disadvantage of covered as compared with direct positions.
(c) The use of night.

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The Limit of Vision as applicable to short base Rangefinder.

By MAJOR E. F. HOBLYN, R.A.

IN putting forward the accompanying remarks, the idea is to show how large is the error made by the eye, and how this error increases as the square of the distance.

The limit of vision practically depends on three conditions:—

(a). The limit of the power of the human eye.

(b). The limit of the power of a telescope to magnify the sight of the eye.

(c). The steadiness of the magnified image.

(a). The average eye can see to two minutes of angle. This can be proved by drawing two black lines one inch apart on white paper; at a distance of 50 yards, it will be found that the two lines become one. The distance of course varies with different eyes, and with the light, but the average is 50 yards. This method is a good way of testing the sight of "would be" specialists.

It is also a good method of finding the magnification of a telescope; viz., find the distance at which the two lines become one with the ordinary vision, then retire until the two lines become one with the magnified vision. The larger distance divided by the smaller gives the magnification. Thus the ordinary vision gives 50 yards, the magnified vision gives 200 yards, the magnification will be × 4.

(b) & (c). The limit of a telescope to magnify the sight of the eye is governed by the steadiness of the image.

A telescope held in the hand is not sufficiently steady to give the best results.

A telescope with imperfect definition, not properly achromatised (i.e. the colour in the lenses not properly corrected), or with imperfect centering of the lenses, will not give the best results.

An image distorted by mirage, heat waves or fog will give different results to observation.

From the above it can be seen that:—

(1). The limit of the human eye is 2′.

(2). It is necessary to have a good telescope of a certain power in a clear, still atmosphere to get the best results.

(d). What magnification is most suitable to these conditions?

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In "Garrison Artillery Training" it is laid down that:—

1 minute makes a difference in range of $\frac{8 \cdot 7 r^2}{h}$ where "r" is in hundreds of yards, "h" the base in feet.

From this formula it follows that:— 2 minutes i.e. the limit of vision $= \frac{17 \cdot 4 r^2}{h}$. Suppose "h" to be one foot.

At	1,000	yards, the limit of vision becomes			$1{,}740 \times 1^2$
„	2,000	„	„	„	$1{,}740 \times 2^2$
„	3,000	„	„	„	$1{,}740 \times 3^2$
„	10,000	„	„	„	$1{,}740 \times 10^2$

Hence, it is seen that the magnification most suitable depends on:—

(1). The available base.

(2). The extreme range to be taken.

(3). The steadiness of the telescope.

(e). What base and magnification is most suitable for different ranges as applicable to one man rangefinders with a self contained base?

From (a) & (d) the formula becomes $\frac{1{,}740 \times r^2}{h \times m}$ where "m" = magnification, r = range in thousands of yards.

Assume that an error of 60 yards is permissable.

At 2,000 yards $\frac{1{,}740 \times 2^2}{60} = 29 \times 2^2 =$ "h × m".

For a rangefinder to be portable, 4 feet is sufficient length of base; consequently

$h \times m = 4$ ft. with × 29 magnification.

At 3,000 yards $\frac{1{,}740 \times 3^2}{60} = 29 \times 3^2 = h \times m$.

At this range, portability is not so requisite, but if required the base must be in two parts, which of course is undesirable. The magnification cannot be raised as increased magnification means increased stability which is incompatible with portability; consequently

$h \times m = 8$ ft. base with × 29 magnification.

At 5,000 yards $\frac{1{,}740 \times 5^2}{60} = 29 \times 25 = h \times m$.

Portability must now give way to steadiness, and the power will have to be doubled; hence

$h \times m = 12$ ft. base with × 60 magnification.

Summing up:—

At 2,000 yards, 4 ft. base and × 29 are best.

At 3,000 yards, 8 ft. base and × 29 are best.

At 5,000 yards, 12 ft. base and × 60 are best.

and with these conditions an error of 60 yards will be made at extreme range owing to the error of the eye.

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From the above, it will be seen how very necessary it is with short base rangefinders to take readings coming on to the object from both sides, and then taking the mean of the two readings. Even this, however, will not give consistent results owing to unsteadiness of the image, due either to unsteadiness of the instrument, or to the unsteadiness caused by heat waves, mirage or fog, especially with the high magnification necessary.

However, working on the assumptions that (1) the error can be reduced by following the above rule, (2) great accuracy is not required at a moving target, and (3) it is undesirable to have more than two patterns of instrument, it may be taken that

Up to 3,000 yards, a base of 4 ft., and a magnification of × 30 will give reasonable results.

Up to 5,000 yards, a base of 10 ft., and a magnification of × 60 will do the same.

The telescope might be made common to both patterns, it only being necessary to have a high power eye piece as is in use with the position finder.

(f). Comparison of service rangefinders at 5,000 yards range :—

Telemeter with 120 yds. base and × 4 telescope.	$\frac{1,740 \times 25}{360 \times 4}$	Error 30 yards.
H. & F. Mekometer with 50 yds. base and × 6 telescope.	$\frac{1,740 \times 25}{150 \times 6}$	Error 48 yards.
G.S. Mekometer with 25 yds. base and × 6 telescope.	$\frac{1,740 \times 25}{75 \times 6}$	Error 96 yards.
Mk. II. "D" D.R.F. with 50′ base and × 46 telescope.	$\frac{1,740 \times 25}{50 \times 46}$	Error 19 yards.

These are the shortest base instruments at present in the service.

It might be interesting to note the accuracy of a P.F. at 300 ft. height $\frac{1,740 \times 25}{300 \times 46}$ Error 3 yards.

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Some Notes upon the origin, formation, and subsequent development of the Madras Horse Artillery, represented in the year 1907 by J, M, P, and R Batteries, Royal Horse Artillery.

Compiled by

MAJOR J. H. LESLIE, Royal Artillery, (retired list).

The origin of the Madras Horse Artillery is set forth in a Government (Madras) General Order of April 4, 1805.

" The Right Honorable the Governor in Council having been " pleased to resolve, that a Troop of Horse Artillery, to be composed " of Drafts from the Battalions of Artillery,[1] and Regiments of Native " Cavalry, shall be immediately formed, the Commander-in-Chief is " requested to give the necessary orders for carrying the arrange- " ment into effect."

This was followed by a General Order by the Commander-in-Chief, dated April 8, 1805. " In pursuance of the G.G.O.[2] dated the " 4th instant, the detailed Establishment of the Troop of Horse " Artillery, has been furnished from Head Quarters to Colonel Bell."[3]

" The following Officers of the Artillery Corps are appointed " to the Mounted Troop, viz.:

" Captain Lieutenant John Noble (229).
" Lieutenant Edward Melian Gullifer Showers (244).
" " George William Poignand (251).
" " William Martin Burton (254).
" " Walter Shairpe (263).
" " Henry Thomas Rudyard (267).
" " Robert Beauchamp-Proctor (268).

(The numbers given after these names refer to Leslie's List of the Officers of the Madras Artillery).

The order continues:—

" Colonel Bell (as senior officer in charge of the Artillery) will " give directions to the Artillery Officers at the several stations of the " 1st and 2nd Battalions of that Corps, to make the Drafts required " for the Troop of Horse Artillery, in the proportions he may judge " proper for each, conformably to the detailed instructions which he " has received from Head Quarters."

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1 There were in 1805 two battalions of Madras Artillery, each consisting of seven companies.
2 Government General Order.
3 Robert Bell (1796), Colonel Commandant of the Madras Artillery.

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"The Officers Commanding at those stations respectively, will "give the necessary orders for facilitating this Draft, and for detaching the men selected by the Officers of Artillery for the Mounted "Troop, to its Head Quarters at the Mount."[1]

"Detailed orders have been sent to the Officers Commanding the "2nd, 4th, and 8th Regiments of Native Cavalry, to furnish the "Drafts required from these Corps for the Horse Artillery."

On January 6, 1806, a further General Order by the Commander in Chief was issued:—

"The Horse Artillery which was established by General Orders "of 4th April, 1805, shall be denominated,

"THE SQUADRON OF HORSE ARTILLERY,"

"and shall be mustered, paid, and returned as such, from the 1st "January, 1806."

"The European Non-commissioned Rank and File, shall be denominated,

"THE FIRST HALF SQUADRON."

"The Native Commissioned, Non-commissioned Rank and File, "shall be denominated,

"THE SECOND HALF SQUADRON."

To the First Half Squadron were posted the Captain-Lieutenant and three Lieutenants, and to the second Half Squadron, the senior and two other Lieutenants.

Thus the Madras Horse Artillery came into being, and this original unit—"The First Half Squadron"—has existed continuously from 1805, and is now—1907—represented by J Battery, R.H.A.

1809. A second troop of European Horse Artillery was formed (G.G.O. January 23).

The following Officers of the "Corps of Artillery" were appointed to the Horse Artillery, on augmentation:

Lieutenant Henry Lindsay (235).
" Thomas Theophilus Paske (283).
Lieut. Fireworker Charles William Black (292).

The troop was formed by drafts from the 1st and 2nd battalions of the Artillery.

On January 27 a further General Order was published directing that "the denomination of the Squadron of Horse Artillery is to be "changed to that of THE CORPS OF HORSE ARTILLERY, and it "shall be mustered, paid, and returned as such from the 1st of Feb-"ruary, 1809."

The Corps of Horse Artillery was divided into three troops, the first and second being composed of Europeans, and the third of Natives, with European Officers.

Thus originated the Battery which is known in 1907 as M Battery, R.H.A., and which has had a continuous existence from the date of its formation in 1809.

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[1] St. Thomas's Mount.

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The establishment of the Corps of Horse Artillery was published in a General Order, dated July 4, 1809.

The equipment consisted of 2 12-pr. guns, 10 6-prs., and 2 5½-inch howitzers. It is not stated how the guns were divided between the three Troops.

On August 1, 1809, the following General Order was published:

"The Honorable the Governor in Council requests that the "Officer Commanding the Army in Chief will issue the necessary "orders for commuting the Guns at present attached to the Cavalry "Brigade[1] now at St. Thomas's Mount, into an extra Squadron of "Horse Artillery, and augmenting them to Ten Guns agreeable to "the following establishment."

This Squadron was officered by a Captain Commanding, an Acting Adjutant, and two Acting Quartermasters, but was not looked upon as part of the Artillery organization. The Captain, Adjutant, and one Quartermaster were Cavalry Officers, the other Quartermaster being a Serjeant Major of the H.A.

1810. G.G.O. March 5. "The Right Honorable the Governor "General in Council having resolved to augment the Squadron of "Horse Artillery and that the Corps shall be composed entirely of "Europeans, is pleased to fix the Establishment of the Squadron as "follows."

The chief points to be noticed in this new establishment are:—

(a) The Squadron consisted of Two Troops, each of the following strength:

1 Captain Lieutenant	2 Trumpeters
5 Subalterns	6 Corporals
1 Quartermaster	12 Gunners
6 Serjeants	120 Matrosses
4 Farriers	

(b) The Squadron was commanded by a Captain.

(c) The equipment consisted of 16 6-pr. H.A. guns—8 to each Troop.

(d) The Native Officers, N.C.O's, and privates were drafted to the 1st, 2nd, 4th, 5th, 7th, and 8th Cavalry Regiments, and were struck off the strength of the H.A. on April 30, 1810.

(e) The new Establishment of the Squadron of H.A. came into force on May 1.

(f) A Farrier and Trumpeter Major were added to the strength of the Squadron by G.G.O. of October 12, 1810.

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[1] These, of course, were the so-called "Galloper" Guns.

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1811. The Head Quarters and a detachment of the 1st Troop, under the command of Captain John Noble (and later under Captain H. T. Rudyard) were employed in the expedition against Java.

Their services in this campaign are referred to in G.O.C.C. of July 22, 1813, and in 1820 (G.G.O. of December 6) the Horse Brigade of Artillery was authorised "to bear on their appointments the word " 'JAVA' in commemoration of their services on the reduction of the " island."

1813. In G.O.C.C.[1] of December 18, a further reference is made to the *Galloper* Guns. " The Commander in Chief directs that " the horses attached to the Artillery Troops of Regiments of Cav- " alry shall not in future be returned as supernumerary, but as a part " of the Establishment of every Regiment to which a Brigade of " guns is attached. The Establishment will therefore be in future :—

" To a Regiment without Guns 501 horses,
" To a Regiment with Guns 527 horses,"

and in G.O.C.C. of March 14, 1815, it was laid down "as a rule of " the service, that when Cavalry guns are brigaded or brought together " to act in Battery, that the command of them shall be given to an " Officer of the Regiment of Artillery, if any part of that Corps is " serving with the Army or Detachment."

1816. The Corps of Horse Artillery was increased (G.G.O. of December 23) "for the purpose of forming a Rocket Troop."

Incidentally it may be mentioned that this Rocket Troop in due course (1825) became C Troop, Madras H.A., and in 1907 is represented by P battery, R.H.A., its existence having been continuous from the date of its original formation in December, 1816.

The additional Establishment necessary for the formation of this Rocket Troop is given in the G.O. above mentioned.

There were 4 Subalterns, 1 Troop Quartermaster, 22 N.C.O's, and 64 Matrosses; 7 Officers' horses, 110 Regimental horses, and 10 camels with drivers. 528 rockets were "carried on the line of march," and 768 were "carried into action."

The Rocket Troop appears after its formation to have made most rapid progress, for on July 15, 1817, the following G.O.C.C. was published.

" The Commander in Chief having reviewed the Rocket Troop, " His Excellency feels gratified in offering to Captain Rudyard and " the Officers and Men of that Corps, his acknowledgments for the " zealous exertions they have given to prepare it at so early a period " of service.

" The correct and complete state of all the appointments, the " expertness of the men, and the steadiness of the horses (so recently " received from the remount), could only have been acquired by the " most unremitted attention and zealous application of that ability " Captain Rudyard so eminently possesses; and Sir Thomas Hislop " feels a particular pleasure in thus declaring to the army his opinion " of that Officer's merits."

[1] General order by the Commander-in-Chief.

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In December, 1817, some H.A. guns were present at the battle of Nagpore (16th) and, with the Rocket Troop, at the battle of Mahidpoor (21st). Their services on these two occasions were referred to in a G.O.C.C. of December 22.

Authority was given in G.G.O. of September 27, 1819, for the Horse Artillery "to bear on their appointments the words 'Mahid-" poor 21st December 1817,' in commemoration of the splendid " victory achieved over the Army of Mulhar Rao Holkar, on that " day."

" Nagpore" was a third Horse Artillery battle honour which was authorised (G.G.O. of March 10, 1826) to be borne by the Corps engaged "during the operations carried on against the city of Nag-" pore, which caused the surrender of that capital to the British " Army on the 30th December, 1817."

These honours were worn on the pouch belt which was made of " whitened buff leather having a gilt plate with 'Java' and 'Mahid-" poor' above, and 'Nagpore' under it." The names 'Java' and 'Mahidpoor' were also worn on the helmet.

1819. On May 8, a general order was published making great changes in the Establishment of the Madras Artillery. The following were the most important:—

(a) Galloper Guns as "a component part of a Regiment of Dragoons or Cavalry" were abolished. The equipment was returned into store, and the N.C.O's of Horse Artillery, doing duty with the Gun Troops lately attached to Regiments of Dragoons and Native Cavalry Regiments which had had Galloper Guns were ordered to rejoin the Horse Brigade at the Mount.

(b) The Corps of Horse Artillery was ordered to consist of six troops:

Two Troops Horse Artillery } Europeans.
One Rocket Troop }
Three Troops Horse Artillery...Natives.

The three Troops of Native Horse Artillery now raised were formed by the transfer of 12 Havildars, 12 Naiks, 396 privates, and 480 horses, from the Governor's Body Guard, the 8 Regiments of Light Cavalry, and the Cavalry Recruiting Depôt.

(c) The designation of "Bombardier" was substituted for that of " Gunner," and " Gunner" for that of " Matross."

(d) The rank of Lieut. Fireworker was abolished.

1821. By G.G.O. of November 20, the Rocket Troop was " commuted into a reserve troop of the Horse Brigade," and so designated.

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In this order the "Establishment of the Horse Brigade or Corps "of Horse Artillery" is given in full.

To the Reserve Troop 4 guns only are allotted.

The columns of the form in which the Establishment is given are headed respectively, "1st Troop, 2nd Troop, and Reserve Troop," which shows that at this date the lettering of Troops had not been introduced.

1824. A General Order by the Governor General in Council was published on May 6, at Calcutta, under instructions received from the Court of Directors in England, dated November 25, 1823, making further changes in the Establishments of the armies of the three Presidencies.

The Madras Horse Artillery was ordered to consist of 2 Brigades of Horse Artillery of 4 Troops each.

This order was not acted upon until 1825, when on August 5, the following G.G.O. was published:—

"With reference to the General Order of the 28th May, 1824, "the Honorable the Governor in Council is pleased to direct, that "the Corps of Artillery shall be organised and composed as follows, "and shall consist of

"Two Brigades of { 1st, or European Brigade. / 2nd, or Native Brigade. } Four Troops each."
"Horse Artillery.

The detailed Establishment of each Brigade is given in the order.

The 1st Brigade had its Head Quarters at the Mount, and the 2nd at Bangalore.

The Troop of European Horse Artillery, raised by the augmentation of 1825, is in 1907 represented by R Battery, R.H.A., and has existed continuously since its formation.

In this manner, the four Troops of Madras Horse Artillery—European—were completed.

Although I have not been able to find any order regarding the lettering of Troops and Companies, in place of the original numbering, there is circumstantial evidence to show that they were lettered about this time, and it may be reasonably inferred that the lettering came into operation at the time of the 1825 augmentation.

The Troops were certainly numbered 1st, 2nd, and Reserve in 1821 as stated above, but in a General Order dated April 6, 1826, reference is made to "A Troop, Horse Artillery," and to a Captain Ley of the 2nd Battalion, who had been doing duty with "A Troop." And this proves that the lettering was in force in April, 1826.

The Troops of the European Brigade were lettered A, B, C, and D respectively, and retained these letters until they were amalgamated with the R.A. in 1861, when they became A, B, C, and D troops of the 3rd Royal Horse Brigade.

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The four Troops of the 2nd or Native Brigade were lettered E, F, G, and H. Although they never became Troops of Royal Horse Artillery, it is thought well to mention their existence because references to them are frequently met with in histories of various campaigns, orders, etc., as Madras Horse Artillery.

G and H Troops were reduced in January, 1831 (G.G.O. of January 4), and by G.G.O. of February 2, 1831, the Horse Artillery was "reduced to one Brigade to be denominated 'The Horse Brigade " of Artillery' consisting of six Troops, four European and two " Native," the Troops beyond the frontier having "six guns, and " those within the frontier four guns each, the European Troops 9 " pounders, and the Native 6 pounders." Hitherto each Troop had had 8 guns.

The detailed Establishment of " The Horse Brigade of Artillery" is given in this order.

E and F Troops continued in existence until 1860 when they were formed into one Troop of 6 guns, and styled F Troop (G.O.C.C. No. 11 of January 21, 1860).

At the time of the amalgamation this Troop still existed, and (vide Madras Army Order dated December 10, 1861) was attached to the 3rd Horse Brigade (Authority. Madras Government No. 4403, dated December 4, 1861) " in gradual absorption." The names of the Officers, who were posted to the Troop, with effect from December 31, 1861, are given in Madras Army Order, dated March 10, 1862.

No further reference to F Troop is found in orders, and it was, no doubt, gradually absorbed.

In 1861 (General Order No. 924, by the Governor General of India in Council, dated at Fort William, Calcutta, October 14) A, B, C, and D Troops, Madras Artillery, became A, B, C, and D Troops of the 3rd Royal Horse Brigade on amalgamation with the Royal Artillery, and the uniform and dress of the latter were, of course, adopted. Consequently the battle honours disappeared from their appointments.

In connection with the latter, mention must be made of the honour granted to C Troop, in recognition of its services in China in 1841-2, of bearing "China," and the device of the " Dragon," on its appointments (G.G.O., Madras, No. 150, dated September 29, 1843).

The Officers of C Troop were allowed to wear special "China" and "Dragon" devices on the breast-plate of the pouch belt, on the plate of the waist belt, and on the saddle cloth (Madras Army Order No. 800, of June 11, 1844).

In recognition of its services in Burmah (2nd Burmese War—1851-3), C troop was granted the honorary distinction of wearing the word "Pegu" on its appointments (G.G.O., Madras, No. 33, of February 2, 1855).

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The following changes took place in the designations of Troops of Madras Horse Artillery, between the years 1805 and 1861, when they became Royal Horse Artillery:—

A TROOP—IN 1907, J BATTERY, R.H.A.

1805. Formed as "The First Half Squadron" of "The Squadron of Horse Artillery."
1809. Became 1st Troop, Horse Artillery.
1825. Became A Troop, Horse Artillery.
1861. A Battery, 3rd Royal Horse Brigade.

B TROOP—IN 1907, M BATTERY, R.H.A.

1809. Formed as 2nd Troop, Horse Artillery.
1825. Became B Troop, Horse Artillery.
1861. Became B Battery, 3rd Royal Horse Brigade.

C TROOP—IN 1907, P BATTERY, R.H.A.

1816. Formed as The Rocket Troop.
1821. Became The Reserve Troop, Horse Artillery.
1825. Became C Troop, Horse Artillery.
1861. Became C Troop, 3rd Royal Horse Brigade.

D TROOP—IN 1907, R BATTERY, R.H.A.

1825. Formed as D Troop, Horse Artillery.
1861. Became D Battery, 3rd Royal Horse Brigade.

Some illustrations are given of Madras Horse Artillery uniform, from photographs of actual articles themselves which belonged to the late General F. F. Whinyates, when serving in the Madras Horse Artillery. They have been most kindly lent for this purpose by Mrs. F. A. Whinyates.

The dress jacket was made of blue cloth "with scarlet cuffs and "collar, edged all round with scarlet cloth."

The medal on the jacket is that known as the "India Medal, "1799-1826." This was not granted until 1851 (General Order, India, of April 14, 1851).

It is of the ordinary pattern, made of silver, with sky blue ribbon, and the clasp engraved "Maheidpoor."[1]

The battle of "Maheidpoor" was fought on December 21, 1817, and General Whinyates was then serving as a Lieut. Fireworker in the 1st Troop, Madras Horse Artillery.

The helmet was "Roman, with glazed skull and peak, etc., red "horse hair mane (to be cut horizontally in line with the bottom of "the ear), gilt scales, front plate bearing the Regimental devices and "honorary distinctions."

The dress trousers were made of sky blue cloth "with two stripes "of gold lace each one inch wide, and a light blue between them "two-tenths of an inch." The stripes of the undress trousers were of scarlet cloth.

Ankle boots were worn.

1 Usually spelt without the 'e'.

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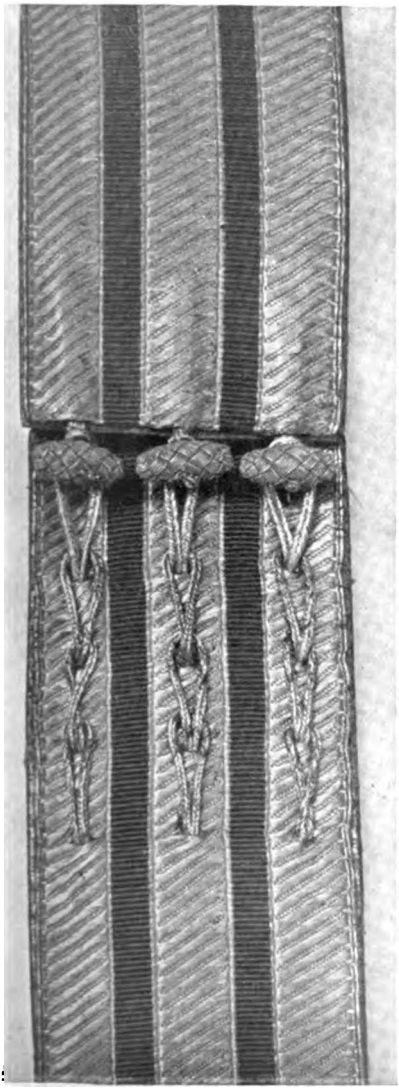
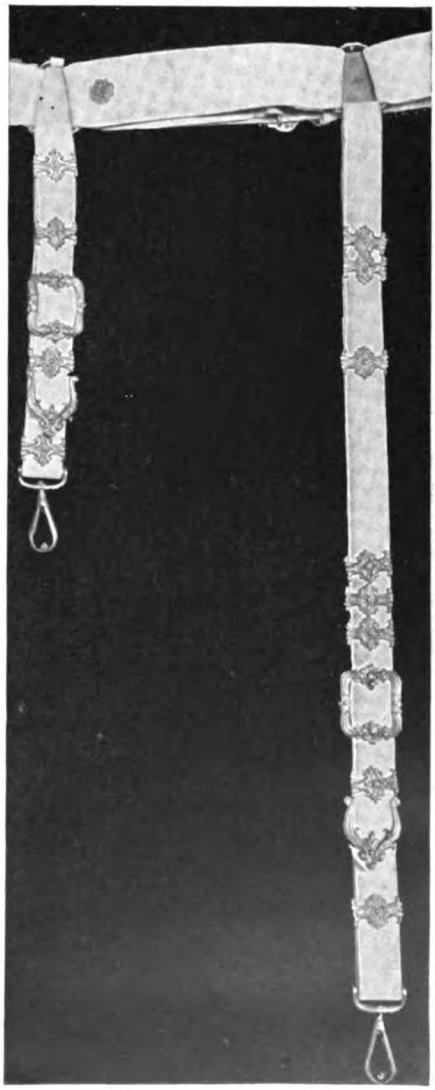
Issued with "The Journa of the Royal Artillery," Vol. XXXIV., No. 6. [To face page 224.

MADRAS HORSE ARTILLERY.

BUCKLE OF WAIST BELT.



GIRDLE.



WAIST BELT.

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MADRAS HORSE ARTILLERY.

HELMET—FRONT VIEW.

HELMET—SIDE VIEW.

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MADRAS HORSE ARTILLERY.

DRESS JACKET—BACK VIEW.

DRESS JACKET—FRONT VIEW.

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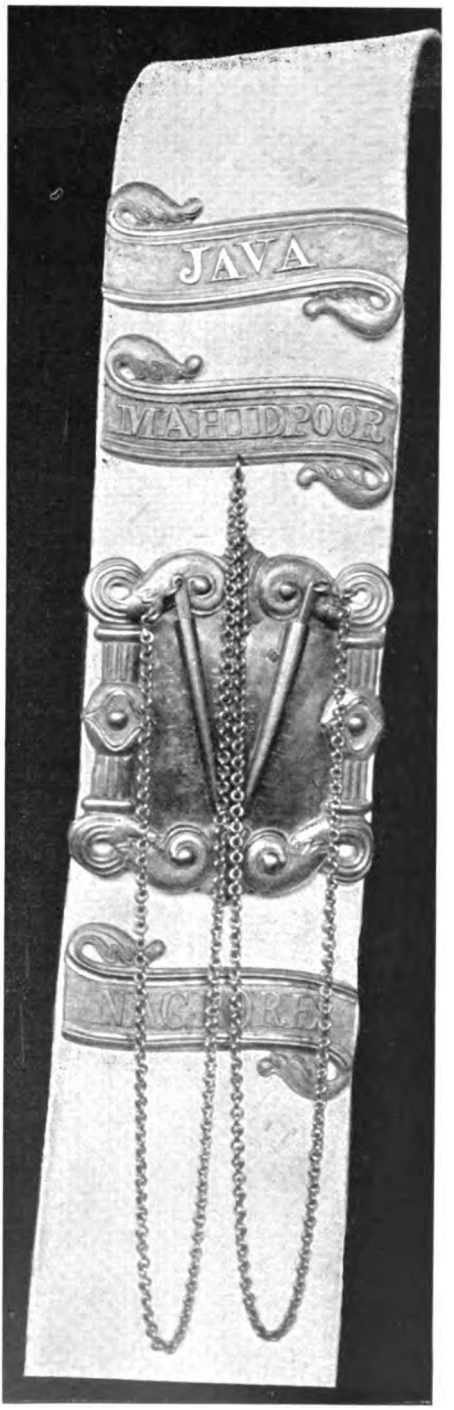
SHOULDER SCALE.



POUCH BELT.

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The girdle was " crimson and gold, three inches wide, with three " gold olivettes and loops." It was always worn with the dress jacket, and fastened two inches in front of the right hip bone, looping to the front.

The waist belt was made of " buff leather whitened, 1¾ inches " wide," and in full dress was worn over the girdle. The pouch belt has already been described (page 221).

Black silk stocks and white leather gloves were worn.

The shoulder scales were " gilt, solid crescent with scales, with- " out bullion." They were worn only with undress uniform.

These descriptions are taken from the " Dress Regulations" of the Madras Artillery as given in the Madras Artillery Records, Vol. IV., pages 763-68.

In the "General Instructions" of these Regulations, No. 17 reads somewhat quaintly at the present day:—"Officers are pro- " hibited from wearing a mixed costume, uniform caps and panta- " loons with white jackets or plain coats, etc."

June, 1907.

NOTE.—There is a complete copy (15 volumes) of " The Madras Artillery Records," referred to in this article, in the Library of the R.A. Institution, Woolwich.

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The Defence of a Temporary Naval Base.

(An abridgment of a Lecture given at Devonport, February, 1907).

By CAPTAIN A. E. C. MYERS, R.G.A.

BEFORE dealing with the actual defence of a temporary naval base, one must first discuss the probability or otherwise of Great Britain with her numerous bases scattered all over the world, ever being under the necessity of acquiring temporary bases. I wish then first of all to shew that it *would* be necessary for her to seize points for such purposes from the enemy, or from a weak neutral, or to make use of some harbour belonging to a weak power allied to us, or even one of our own harbours hitherto unfortified, or to seize a harbour merely to deny it to the enemy. To do this it will be necessary to refer to former wars, and then to shew that the conditions of those wars are applicable to the present time. Firstly then to prove that naval bases somewhere near the scene of action were necessary. This can be done by shewing how, without a base in the Mediterranean, England never cut any big figure there, like she afterwards did when in posession of bases. The commencement of our importance in the Mediterranean really dates from 1704 when Rooke took Gibraltar. Our influence had been felt there off and on before that date, but our position more often than not was a precarious one. It is true that Mr. J. S. Corbett has written a very interesting book called "England in the Mediterranean, 1603—1713," but after reading it one must come to the conclusion that the part played up to 1704 was often small and sometimes inglorious, owing to lack of bases, and that there were long intervals during which our ships were absent altogether. To quote two or three of the failures, there were Mansell's expedition against Algiers in 1620, Buckingham's expedition against Spain in 1625, and the Dutch War in 1655.

Following up the capture of Gibraltar in 1704 we got Port Mahon in 1707, and then with these two good bases became of real importance, and continued so for 50 years until 1757, when Port Mahon fell to a sudden attack by the French, and we were left with no base within the Mediterranean. The result of this was, to quote Colonel Callwell, "the insurance of French cargoes from Marseilles fell from £60 to £15 per cent, and during the next few years, when France was experiencing disaster after disaster all over the globe, the Mediterranean remained open to her trade and replenished her ebbing resources."

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I will pass over Hood's operations before Toulon, as I am taking that under temporary bases.

In 1798, we again entered the Mediterranean, and were then able to use the friendly ports of Leghorn, Naples, Sicily, and Sardinia. We also recaptured Minorca. Malta was captured in 1800, and we were in a splendid position with Gibraltar, Port Mahon, and Malta all in our hands. However, at the peace of Amiens Minorca was restored to Spain, and we were left with Gibraltar and Malta only.

The foregoing events shew that without bases in the Mediterranean we were never of much account, but that as soon as we had two bases, Gibraltar and Malta, or Gibraltar and Port Mahon, we were more or less at home there and had to be seriously reckoned with. We have thus seen that permanent bases somewhere near the scene of operations are necessities.

Now to shew that these are not always sufficient if not near enough to the enemy's coast.

Take Toulon. In 1783 we began the last great struggle against France with only Gibraltar. This was at once felt, as when Hood was driven from Toulon which the Royalists had surrendered to him, by Napoleon who was then a Major, he had no base nearer than Gibraltar from which he could watch Toulon. He remained some time lying off Hyeres, but of course could make no base there, so he turned his attention to the Northern ports of Corsica, the inhabitants of which were then hostile to the French. He took Bastia and Calvi, Nelson being the leading spirit on land in each case, and used these ports. Elba, the property of a neutral, was also occupied.

Corsica, however, required a considerable garrison and its safety practically depended on the presence of the fleet, so when Spain joined in the war, first Corsica and afterwards Elba were evacuated, and we were again left with only Gibraltar and evacuated the Mediterranean in 1796.

Take again Nelson's operations when watching Toulon during the two years preceding Trafalgar; he found Gibraltar and Malta insufficient and used Sardinia which was neutral, finding a splendid harbour in Maddalena Bay and another in the Gulf of Palmas.

Hood's action was what was referred to in the commencement, as seizing a point belonging to the enemy, and Nelson's action as seizing a point belonging to a weak neutral.

A number of authorities scout this latter as being impossible in the present state of modern civilization, but in 1905 I read a French article entitled "The danger of the Balearic Islands." The writer maintains that at the outbreak of war, we (England) would at once seize a port or ports in them, and so cut the Toulon—Bizerta line. What is his remedy? To come to an understanding with Spain that the latter should keep them properly defended, or should in time of war allow France to do so, or failing that for France to seize them on the outbreak of war.

Again quoting Colonel Callwell's book, there is yet another way of dealing with a weak neutral, and that is to force him into the war against you on some pretext, and then seize any ports of his you want. An exampe of this occurred when we found ourselves at war with

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the revolted American Colonies, France and Spain; England forced Holland into the war. and by so doing obtained a military advantage, for without increasing the strength of her opponents, several important but ill-defended military and commercial positions were thereby laid open to her arms.

In addition to the examples of Hood and Nelson before Toulon, I will briefly refer to three other occasions when secondary or temporary bases were important features. In 1778 Rodney wanted to have under observation the French Fleet at Martinique. He had no base near so he captured St. Lucia, and lay there with his battleships while his frigates watched the French Fleet in Port Royal Bay.

In 1867 the Federals wanted to blockade the Southern coast but had no base near, so seized Port Royal and held it for the rest of the war.

In 1782 when Suffren arrived in the East, he found himself with a squadron decidedly stronger than Hughes', but the nearest French base was the Ile de France, now Mauritius, and Suffren had no other Port on which to base his operations, Cuddalore being only an open roadstead, and all the French and allied ports having fallen before he arrived. The whole campaign pivoted about his getting a base. He went for Trincomalee; this brought about a battle, and it was not until he had fought three battles with Hughes that he captured Trincomalee. After every fight Suffren complains bitterly of no reserves of men, provisions, spare stores, rigging, &c., whilst Hughes at Madras found everything necessary, and it was only owing to Suffren being so great a commander that the French were able to affect anything.

I think enough examples have now been taken to shew that in the past additional bases to the permanent bases have been always required, in whatever part of the world the fighting has been carried on.

Now comes the question, do we in the present day want bases as much as in former days? Are our ships more independent or less so? Although now there is no difficulty as to water, a battleship wants coal, food, stores, and ammunition. All of these can be transhipped at sea under favourable circumstances, but a handy base is to be preferred from every point of view. A fleet, if blockading or watching a harbour, is the better for being itself in a harbour. Ships can then be kept full of coal, ready for sea, with clean boilers, and no defects. Another reason in favour of a temporary base near at hand is that a cable can be laid from it to the nearest British posession and intelligence sent home quickly and without interception. But apart from big ships, large numbers of small craft are wanted for watching or blockading a port,—the composition of Togo's fleet before Port Arthur bears this out,—also torpedo stations containing no large ships, such as many of the defense-mobile stations of the French, would probably be blockaded by torpedo boat destroyers alone without the assistance of larger vessels, except perhaps a parent ship, and *when small vessels are used, a temporary or flying base becomes an absolute necessity.*

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I take the following examples of the value of temporary bases for coaling purposes from the United Services Gold Medal Essay of 1904. Presume 12 Implacable class blockading Toulon; then, what they have to do is to stop the Toulon fleet joining a fleet say at Brest. They must, therefore, be ready for a chase of 1,300 miles and a battle. This roughly equals 800 tons of coal below which they must not fall. If they coal at Malta, on certain days they dwindle to 5 on blockade. If they coal at Pollenza Bay they would never fall below 10. If instead of blockading, 4 cruisers were watching Toulon, if they coaled at Malta, they might dwindle to 1, but if they could coal at Pollenza Bay, the numbers would never get below 3.

The question of secondary bases seems rather involved with blockading and whether a close blockade is now-a-days possible or not is a matter of very divergent opinions,[1] however, in 1905, a French writer in "Le Spectateur Militaire," devotes three long articles to the subject of the French Coast Islands, which he says we, Great Britain, would seize on the outbreak of war. He pleads for their being better armed, and quotes history as to our having taken them in former wars, referring to Belle Ile and the Isthmus of Quiberon. This is indeed a close blockade with a vengeance. As regards submarines stopping a blockade, his argument is that a submarine is a good or useless article. If it is a good one, then we shall use it for blockading, but that they require more than anything else a handy base, and that, therefore, we are bound to seize bases in these islands. In confirmation of these articles, in 1905 during the French Naval manœuvres, the attack on the islands of Belle Ile and Quiberon was a feature.

There can be no better instances of temporary bases than the Russo-Japanese War, where we have of course the well known "certain place" in the Elliot Islands used by the Japanese as a temporary base. The battle fleet used to lie here by night and cruise to Round Island by day; when the rough weather came on even this base was not suitable for small craft and the latter used Dalny.

I think then we may come to the conclusion that whether a fleet is blockading, or, if the old time close blockade is impossible, owing to modern conditions of warfare, watching a strategical point, it will want regular supplies of coal and stores, and either a very large number of vessels would have to be employed so as to allow a certain number to be always coaling, &c., or temporary bases would have to be established somewhere near, and that anyway for small craft they are a necessity.

Now comes the actual defence of these temporary bases.

The first question is, who is to defend them? The Navy or the Army? The answer is the army for the following three reasons:—

(1). The navy have not got the men to spare.

Judging by past wars all the personnel of the navy will soon be swallowed up, and as the reserves of the navy are small, it is certainly advisable that wherever the army can relieve the navy the better. I have read lately that the loss of personnel will be less in

[1] The R.U.S.I. Naval Essays of 1898, 1902 and 1904, all deal with this subject, and the writers come to different conclusions.

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future wars, but even so, it is doubtful when all ships are fully commissioned, there will be many men left for shore duties. It may be argued that there will also be no men to spare from the R.G.A. and R.E. Granted, at the present rate of reduction, but the defence of a base suddenly seized must be more important than manning movable armaments at home, and there will anyway be the territorial army to fall back upon for home defence.

The second reason is that the navy have not got the guns or lights to spare. Unless they disarm a ship, they can only put on shore a couple of short 12 Prs. on wheels. Now the great majority of those who are specialized in anti-torpedo boat defence from the shore will readily assent to the fact that guns on wheels, to say the least of it, are quite unsuitable for this work. There are, as far as I know, no statistics to go upon, as to how unsuitable a gun on wheels is, but it is self evident, that it would be impossible to follow a torpedo boat with any accuracy, and the number of rounds per gun per minute must be also slow. However, from what I have read and heard on this point, no idea is entertained in the navy of there being any likelihood of these guns failing to do what would be required of them in war time. In naval manœuvres these guns are landed and used as anti-torpedo boat guns. I am not certain on the point, but as far as I can make out, no practice at targets representing torpedo boats takes place from them, and I take it that among the many more important duties of the navy, this, to them, small point has escaped attention. The navy are increasing the calibre of their anti-torpedo boat gun, and I should imagine the landing gun will be of the same calibre. If so, it will of course be even less handy than their present 12 Pr. As to lights, again there are none to land unless the ship is disarmed. I have heard it stated by naval officers that they prefer to lie in darkness, but I take it, this does not apply to a harbour, and anyway, if guns are landed, lights are required to fight them by. Small vessels may be used and stationed where a light is wanted, but this seems rather extravagant, using a vessel as a light.

The third reason is that with us it is not the navy's rôle to man coast defences, and they are not trained for it.

An argument in favour of the navy manning these temporary bases is they know exactly what they want, the base is for them alone, and co-operation between land and sea would be easier. Granted *if the navy were trained in coast defence.* That the Japanese entrusted the defences of their temporary bases to the fleet is no argument, as the Japanese navy run the coast defences; with us the navy do not run the coast defences, and unless they are trained in this respect, their conduct of the defence of a temporary base must necessarily fall short of what it should be.

Our secondary base is then to be defended by the army, i.e. the R.G.A., R.E., and some infantry. Now comes the question, to what extent is it to be defended? We must strike some mean between, say, the defences of Plymouth and a Corporal's guard. One cannot improvise defences against a determined attack, supported by armoured vessels, to retake the place, but can do so against the attempt

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of a cruiser to come in and land men to burn stores of food and coal, repairing shops, &c., against torpedo boat raids, and against landing parties unaccompanied by armoured ships.

To deal first with torpedo boats. What is wanted is the anti-torpedo boat gun on a fixed mounting. Now if concrete is used for fixing up this mounting, some months must elapse before the guns can be fired, as if fired from sooner, there is a danger of displacement to the concrete and so the whole emplacement would be quite useless. So the sealed pattern concrete mounting cannot be entertained. There is nothing laid down as to what can be done in the way of improvising a mounting in a hurry, but of course it can be done. Captain Meares, R.E., tells me that he considers that with plenty of men and in ordinary soil, an improvised mounting could be put up in a couple of days or even less. He suggests instead of anchoring plates, a framework of 12″ timber baulks, the holding down bolts secured to these, and a parapet built on top to prevent them from lifting. If necessary, the mounting could be made more secure in a variety of ways either by anchoring down the ends of the baulks, making the baulks longer, using specially made longer holding down bolts, or putting on a heavier parapet; but the whole question wants going into; there must be one best way of doing it, and this should be found out by experiment and a cut and dried method laid down and circulated. It would not cost much to have the necessary material kept ready at two or three large stations.

As to searchlights, I am told that searchlights and engines could be erected and put in order in a couple of days.

Now as to coping with a cruiser. The anti-torpedo boat guns are useless, and the only thing they would have to do is to keep quiet and not disclose their positions. It would be possible to mount 6″ guns in a similar way to the 12 Pr., but it would be a much more difficult and lengthy operation. I would suggest 6″ howitzers on platforms. There are plenty of these in the country, allotted mostly to movable armaments whose owners would gladly spare these, to them, white elephants. Their fire would not be very accurate, nor very fast, but they could be put in position very quickly, and the mere fact of being fired at by high angle fire with 120 pound lyddite shells would probably deter a cruiser bent on a raid and expecting to meet a light Q.F. gun, from carrying out her mission. She would be unable to silence the howitzers and they could do her serious harm. We shall thus have for the defence of our temporary base, some light Q.F. guns and 6″ howitzers manned by the R.G.A., some searchlights worked by the R.E., and some infantry with machine guns to assist in opposing landings and for the defence of the land side. A certain number of guns and lights would probably be sent out. The Officer Commanding might be asked how many guns he considered necessary, but this, anyway as regards the anti-torpedo boat defences is a complicated question and too long to be discussed here. It would depend on the number of boats likely to attack the place, how secure it is desired to make it, the width of the entrance, and the height the guns could be mounted.

I do not propose in this paper to go into the details of how the

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guns, lights, and howitzers should be sited, except perhaps to query whether in view of the very intimate relations of the guns and lights, both in the siting as well as in the fighting of each, they should not be run by the same Corps.

To recapitulate shortly, the conclusions arrived at are:—

(i.) Temporary bases will be a necessity.

(ii.) Their defence shall be entrusted to the army, as the navy have not got the men, guns, and lights for the purpose, and they are not trained for this particular work.

(iii.) The armament should be anti-torpedo boat guns, searchlights, and 6″ howitzers.

I now come to the "raison d'etre" of this article.

If there is any show of reason for the above it should be practised in peace; and how easy to practice! What a chance in combined manœuvres!

There must be plenty of reserve 12 Prs. and mountings; an extemporary mounting as described would cost hardly anything, and I think if officers of the rank of Captain and Major were liable to get an order to embark with so many men and a few 12 Prs. and mountings, and after a certain place had been seized, to at once put up anti-torpedo boat defences in conjunction with the R.E., it would be to the advantage of the R.G.A., both from the point of view of the training and the knowledge necessarily involved. It would also probably turn out to be the most interesting piece of work one would ever be called upon to do. Even if it is not actually laid down that the R.G.A. should be used for such purposes, still, if it was generally recognized that they were trained in and prepared for putting up some sort of temporary defences as above described in a couple of days, there will be a great chance of their being used for such purposes when war comes.

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THE AUSTRIAN Q.F. FIELD GUN
(1905 pattern).

By LIEUT.-COLONEL H. A. BETHELL, R.F.A.

(Several of the details here given are derived from a pamphlet by Major R. Kühn, of the Austrian Army).

THE new Austrian gun is a quick-firer of 3·02 inches calibre, firing a 14·7 lb. shell with M.V. of 1640 fs. In general design it is not unlike the Ehrhardt 15 Pr. supplied to this country in 1899, and it bears a still stronger likeness to the American Q.F. gun.

The gun:—

This is a single block of forged bronze. It is 30 calibres long and is rifled with increasing twist. The breech action is a wedge very similar to that of the German gun already illustrated in the "R.A. Journal," No. 3, Vol. XXXIII. It has a repeating trip-lock and is fired by a lanyard from the right hand side.

The carriage:—

The under carriage consists of a box trail, straight axletree, and wooden wheels. These are remarkable in that 4 of the 12 spokes are set in spoke-shoes which cover the joints of the 4 felloes. The remaining spokes have through tongues. The trail carries two spades, namely, a large folding spade 32″ wide and 7·5″ deep, and a small fixed spur for use on hard ground.

Instead of an intermediate carriage there is a saddle on which the cradle is pivoted. The saddle is similar to the stool-bed of our old garrison carriages; it is pivoted horizontally with capsquares on the (round) axletree. It has a recess forward of the axletree for the vertical trunnion of the cradle. The rear end of the saddle is supported by the elevating screw, and forms the traversing bed on which the cradle traverses. The elevating screw is set centrally and is of the ordinary double-screw pattern.

The brake gear is identical with that on our Ehrhardt 15 pr., and consists of 2 brake-blocks on arms pivoted to the trail and connected by tension rods to a cross piece under the chase. The brakes can be put on from the front or from the rear.

The carriage has axletree seats of steel plate lightened by large perforations.

The upper carriage:—

The cradle is a drawn steel tube manufactured by the Ehrhardt process. It is of circular section with guides formed on top of it on

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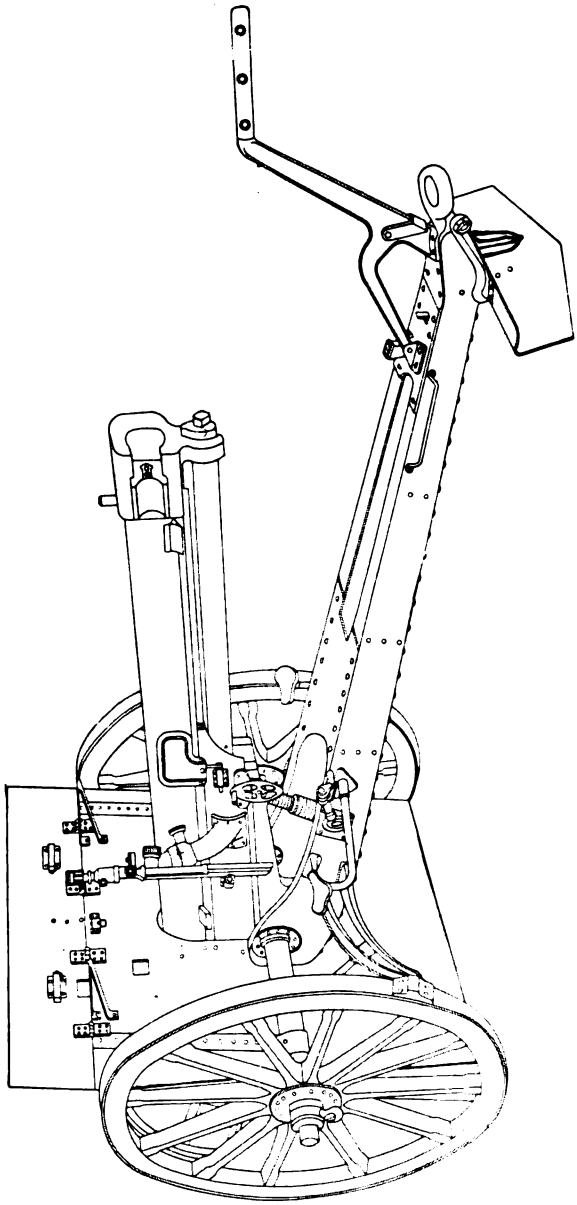

which the gun recoils; these guides are embraced by claw-shaped blocks formed on the gun. The cradle contains the buffer and springs, which are similar to those of our 15 pr. Q.F.

The buffer is fixed to a horn at the breech of the gun, and recoils with it. It is of plain construction, without running-up valve but with check-buffer, and is nearly filled with glycerine. It is surrounded by a column of 5 helical springs of flat rectangular section, without parting plates. The springs are compressed on recoil to about one-third of their working length. The initial compression is nearly 5 cwt.

The sights:—

The gun is sighted on the cradle with arc sights, to which a panorama attachment is fitted. The fore sight has the acorn on a projecting arm which can be turned in towards the gun, out of the way of the man on the axletree seat. The arc sight is an improved edition of that on our 15 Pr. Ehrhardt gun. Its socket can be cross-levelled to eliminate difference of level of wheels; the cross-level is set at an angle to compensate for drift. The longitudinal level is fixed on the arc scale, low down on the left hand side, so that the layer can look down upon it. Unlike the German gun, the Austrian gun has no sliding scale on the sight for correcting the length of fuze.

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The panorama sight is fixed on top of the arc sight when required. It is of the ordinary Goerz construction already described in the "R.A. Journal," namely, a fixed vertical telescope with a moveable cowl containing the object glass, which can be directed to any point of the horizontal circle; it thus serves the purpose of a goniometric sight. It gives a high line of sight clear of the lower shield and wheels.

The clinometer on the arc sight is similar to that on the 18 pr. Q.F. sight.

There is no degree scale in the whole equipment. The clinometer is graduated in *lines*, each *line* being equal to 1/6400 of a circle or about 3¼ minutes. The deflection scale and the horizontal circle of the panorama sight are also graduated in lines; the arc scale in lines and in metres of range.

Lines have been adopted instead of degrees and minutes, since a decimally divided scale can be read more easily, and with fewer mistakes, than one divided into 60 parts.

The shield:—

This is of hard steel 4½ millimetres or nearly 3/16 of an inch thick. It is in three parts. The central part fills up the space between the wheels above the axletree. The lower part hangs down nearly to the ground, and is folded towards the muzzle for travelling. The top part extends when erected to a height of 5′ 3″ from the ground. When folded down the top part extends horizontally to the rear, level with the top of the wheels, so as to give a considerable amount of overhead cover.

Ammunition:—

The gun fires fixed ammunition, including shrapnel and high-explosive shell. The shell contains a burster of ammonal, which is composed of 75 parts sal-ammoniac, 5 carbon, and 20 metallic aluminium. This substance is said to detonate (or at least to explode violently) without requiring a fulminate primer. The shrapnel and H.E. shell are both peculiar in that they have a copper centreing band at the shoulder as well as the copper driving ring; this arrangement is said to give good shooting.

The shrapnel contains 316 bullets of 50 to the pound, 16 of 35 to the pound, and a driving charge of nearly 3 oz. black powder.

The fuze is of brass, of the ordinary double-banked pattern.

The brass cartridge case contains 1·17lbs. tubular nitro powder.

The limber:—

This is very like that of the German gun illustrated in No. 3, Vol. XXXIII., of the "R.A. Journal." It is divided into 12 compartments, of which 11 contain ammunition baskets, each holding 3 rounds. There is a large flat store box which extends over the whole foot-board and forms a foot-rest of convenient height for the men sitting on the limber box.

The most remarkable feature of the limber is the limber hook, which is on vertical instead of longitudinal springs. This is because

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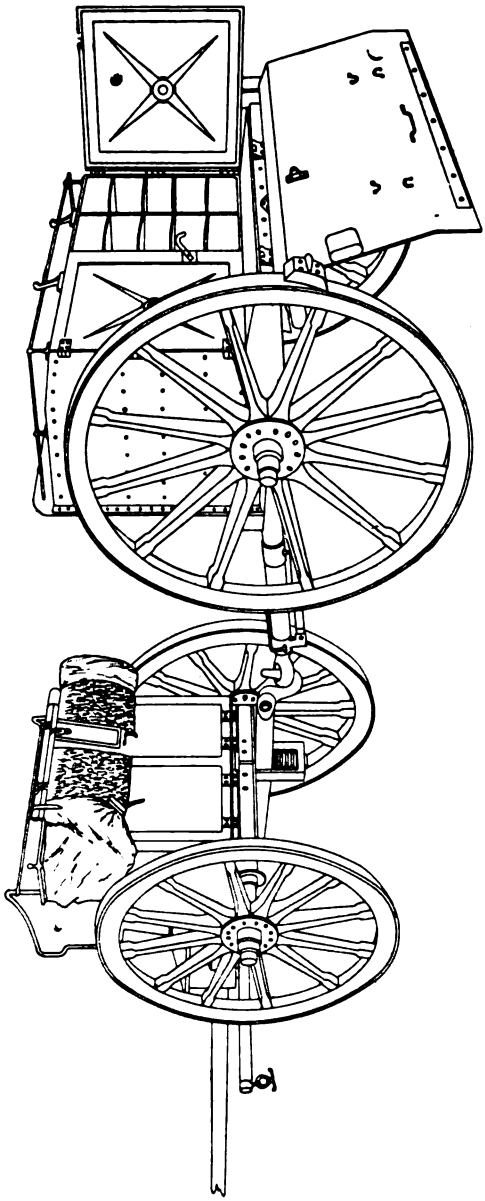

the great width of the spade renders it necessary for the limber hook to project about 18 inches to the rear of the axletree in order to allow the carriage to lock. The weight of the trail thus acts with considerable leverage, and the jerks which occur in travelling over rough ground would cause the point of the pole to fly up with great violence if it were not for the springs interposed.

The wagon body:—

This is considerably higher than the limber, having compartments for 20 baskets in 5 tiers of 4 abreast. There are no seats, but the top is surrounded by a rail, and corn sacks, &c., are carried on it.

The wagon body is unlimbered beside the gun in action, perch to the front. It is not tipped like the French wagon but is supported by props. The steel doors open outwards, forming side shields; besides this a shield is fitted which hangs down to the ground from the rear platform board. The latter forms a shelf for handling ammunition.

There is no fuze setting machine, but an automatic fuze-key is provided.

General remarks:—

The new Austrian gun seems a strong, simple, and serviceable gun, of moderate weight and medium power. It is perfectly steady in action; the sights are excellent, and the overhead shield protection is a feature worth imitating. The system of firing by lanyard is not well suited for a Q.F. gun, as it takes practically all one man's time to make ready and fire; our own system of letting the layer fire with a firing-lever is preferable.

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The small size of shrapnel bullet may be taken exception to as unduly reducing the effective depth of the beaten area. The idea is presumably that even a slight wound suffices to disable a civilized soldier. On the other hand, the 3 oz. driving charge helps in some measure to compensate for the deficient weight of the bullets.

Ballistics:—

Range, yards.	Elevation.	Remaining velocity, fs.	Time of flight, seconds.
1000	1° 11′	1335	2·05
2000	2° 45′	1100	4·65
3000	4° 42′	972	7·65
4000	7° 13′	878	11·
5000	10° 15′	802	14·7
6000	14° 4′	735	18·75

Weights, dimensions, etc.:—

Muzzle velocity .....1625 fs.
Weight of shrapnel and H.E. shell.....14·72 lbs.
Number of bullets in shrapnel.....316 + 16.
Weight of bullets to the pound..... 50 and 35.
Weight of driving charge..... 2·95 oz.
Weight of burster of H.E. shell.....7·2 oz.
Weight of powder charge.....1·17 lbs.
Weight of gun and wedge breech action.....6·98 cwt.
Calibre.....3·02 inches.
Rifling, twist increasing from 1 in 45 to 1 in 25 calibres.
Sights.....Arc and panorama.
Metal of gun.....Forged bronze.
Total length of gun..... 90 inches.
Height of axis.....39·5 inches.
Length of recoil, normal.....50 inches.
Length of trail on ground line.....8 ft. 4 ins.
Height of wheels..... 4 ft. 3¼ in.
Thickness of shield.....0·177 inches.
Weight of gun and carriage..... 19·8 cwt.
Weight of gun limbered up without men or kits..... 35·3 cwt.
Weight of wagon without men or kits..... 36·2 cwt.
Number of rounds in gun limber.....33.
Number of rounds in wagon.....30 + 60.
Number of guns in battery.....6.
Number of wagons.....9.
Rounds per gun with battery..... 168.

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Choice of Positions for Artillery in the Field.

By COLONEL F. G. STONE, *psc.*, R.G.A.

THE choice of a position whether in attack or defence, is, in the first instance dictated by purely tactical considerations; that is to say,—the position of batteries, relatively to the ground over which they are required to fire, must be considered with a view to being able to obtain the greatest tactical advantage out of the artillery fire, and this is purely a question of tactics.

But we have further to consider, in the attack, how we are to arrive at the position; the fact of having shielded guns will not help us to minimise casualties until our batteries are unlimbered; or, to put it in another way,—the fact that our guns are shielded will influence us considerably in the choice of a position, but *it will not help us to get there.*

It is possible that in the heat of the controversy which is raging anent "concealed positions," the arguments on both sides may converge too much on the purely technical aspect of the questions of fire effect from, and casualties in, concealed positions, as compared with positions in the open.

At the battles of Te-Li-Ssu and Ta-Shi-Chiao the Japanese Artillery were compelled to give up the attempt to support the infantry attack by advancing in the open, on account of the casualties among the horses; at Ta-Shi-Chiao they were subjected to fire, only from concealed positions, even the flashes of the Russian guns were not visible. Guns can often change position singly. At the battle of the Yalu a Russian battery which tried to change position was overwhelmed by Japanese artillery fire, and again a half battery (4 guns) moving as a whole, was brought to a standstill and captured. On the other hand, a single gun on this latter occasion got safely away; and in the battle of Sha-Ho, two whole Japanese batteries moving by single guns, at long intervals, crossed a shrapnel swept zone without losing a man or a horse.

At Liao Yang the formidable Shu-Shan-Pu position was defended by the Russian artillery by means of indirect fire from well concealed positions, and so successfully, that after two days fighting the Japanese were compelled to carry the position by a night attack at a heavy sacrifice of life.

"Field Artillery Training" p. 180, says, "A superior force of artillery *that can be located*, may well be rendered powerless by an inferior force, if the latter be concealed and its fire well directed."

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The battle of Ta-Shi-Chiao above mentioned is a striking instance of this; the Russian artillery, in concealed positions, being only half the numerical strength of the Japanese artillery which had to attack more or less in the open, and yet scoring a complete victory practically off its own bat.

Lieut.-Colonel Haldane, D.S.O., in commenting on this action says, "The Russian position at Ta-Shi-Chiao was admirably adapted for a force inferior to its adversary in Artillery; for the guns, with their long range, were able by utilising indirect fire, not only to engage the superior strength of the Japanese in that arm, but *could with impunity direct their fire exclusively against the infantry*, whenever it attempted to press forward to the attack.

The inferior mobility of the Japanese artillery no doubt rendered it an unusually easy target when on the move.

The small results obtained on several occasions by the Russian artillery against the Japanese infantry attack, seem to have been due more to bad fire discipline than to position; the poor results usually obtained against this nature of target occurring equally when direct laying was employed as when firing from behind cover; the casualties inflicted on the Japanese were greater when halting and lying down than when making rushes; rushes were 100 yards long under artillery fire.

"Field Artillery Training" p. 179, says, "To support a decisive attack on a position, guns should occupy positions within effective range, by moving into them at night." The battle of Shi-Li-Ho is a good instance of this. A direct attack was the only thing feasible for the Japanese, the country in front of the Russian position was absolutely open, and the flanks rested on a river. The Japanese accordingly entrenched their batteries during the night within 1,500 yards of the Russian defences to support the close attack.

Major J. F. Cadell, R.F.A., has written a very able article in the December number of the "Royal United Service Institution Journal," advocating "the crest position, *not necessarily visible to the attack*;" his plea being, that "it is the more generally useful, as, on "the whole, from thence, the best view of the entire situation is "obtained and the guns can most rapidly be turned on whatever "may appear, while the contour of the ground cannot prevent the trajectory of the gun reaching any given spot."

Colonel F. D. V. Wing, C.B., R.F.A., in an article in the April number of this Journal, generally agrees with Major Cadell, rather on the assumption that guns can be concealed close behind a crest, for indirect fire, and run up by hand into the open for direct fire. He says, "An important essential for a concealed position seems, "therefore, to be that the guns are so placed that they may be push-"ed rapidly into direct fire if required."

There is some danger here of a fallacy becoming current, and it is as well to at once eliminate the hitherto cherished theory, that a gun just behind a crest cannot be easily located, and that it can at any time be run up by hand into a position for direct fire.

Colonel W. E. Blewitt, C.M.G., Camp Commandant at Okehampton, says in his 1906 report on the subject of concealment:—"There

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" was a general tendency among the batteries practising at Okehamp-
" ton, not to go definitely enough for absolute concealment when the
" tactical situation required it and the ground permitted it.

" In such cases the concealment should be thorough and com-
" plete. In the intermediate stages, it is often a question whether
" partial concealment, or concealment only until the first round has
" been fired, effects any useful purpose; rapidity and scope being gen-
" erally sacrificed to obtain a doubtful advantage. The cloud of dust
" caused by firing the Q.F. guns betrays their position as much as
" smoke from a black powder charge would. It is very doubtful
" whether in a defensive position guns could be run up by hand to a
" crest to repel infantry attacks, &c. It seems preferable to entrench
" them straight off in positions where they could fire in every direc-
" tion required of them."

Colonel Blewitt has introduced the word "defensive" in the foregoing paragraph; from this it may be perhaps inferred that in the attack, he considers that, in some cases, guns *could* be run up by hand. Colonel Wing is doubtless thinking of such cases, and does not intend to encourage the idea that guns can under any circumstances, e.g. to seize a fleeting opportunity, be " pushed rapidly into direct fire " to engage a rapidly moving target which may only be exposed for a few minutes.

When it is a question of closely supporting the infantry attack, however, it seems probable that the normal method will be to allot certain batteries for this duty and intrench them overnight within decisive range of the objective. (see ante).

To return to Major Cadell's text:— There are many arguments in favour of Major Cadell's contention, and these have been adduced with great clearness and ability; it is, however, essential to avoid the risk of being run away with by any idea, without clearly realising all that it entails, and the best way to do so, is to consider carefully the advantages which a concealed position confers, and to weigh them deliberately before deciding to forego them in favour of " the crest position, not necessarily visible to the attack." These advantages are:—

(a) Inability of the enemy to locate the positions of our batteries, thus increasing his tactical difficulties by importing a serious element of uncertainty into his dispositions.

(b) Freedom of manœuvre.

(c) Freedom from interruption by enemy's fire, less liability to enfilade shrapnel fire, or frontal common shell fire.

Major Cadell, however, scarcely does justice to the achievements of the Russian artillery firing from concealed positions, when he says, " The accounts of the Russian batteries which fired all day and
" lost three horses when in a secluded position, may be believed, but
" it is rather hard to believe that those batteries were much more
" use to the Russian Army than if they had remained in Siberia and
" fired off their ammunition into Lake Baikal. It is quite certain
" that the Japanese were not defeated by these tactics, (?Ta-Shi-
" Chiao, Shu-Shan-Pu, &c.) and when we consider the numbers en-

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"gaged and remember that the Japanese were always on the offen-
"sive, it is obvious that this artillery fire was not more destructive
"than the rest of the Russian fire. To remain in action all day and
"fire off thousands of rounds over a hill is not an object in itself
"even if you only lose three horses; what is required is victory,
"even if obtained at some expense by the artillery."

The above is perhaps a fair criticism of some of the engagements, but it does not alter the fact that on several occasions when the conditions were suitable, the Russians did employ indirect fire from concealed positions, with such conspicuous success that they compelled the Japanese to have recourse to costly night attacks as the only means of coming to close quarters with their well concealed adversary.

Major Cadell continues, "I have not found that the Japanese
"used this kind of fire except in siege or semi-siege operations,
"when of course, the case is quite different."

Surely this is somewhat overstating the case; as a matter of fact the Military Attaché's accounts give endless instances of fire from concealed positions by the Japanese, and the Japanese artillery was somewhat severely criticised by many Japanese infantry officers on this account.

At the commencement of the war, the Japanese found themselves with a gun considerably outranged by that of the enemy and were accordingly obliged to pay great attention to cover in order to be able to approach at all within their own effective range of the target. The battle of Yafango (June 14th and 15th, 1904), was a conspicuous success for the Japanese artillery, which, owing to the excellent concealed positions taken up, was able to inflict heavy casualties on the Russians, and literally compel them to evacuate their position before the pressure of the turning movement on the Russian right flank was actually felt.

In the earlier engagements, before they had fully gauged the Russian artillery fire effect, the Japanese certainly resorted to indirect laying from concealed positions, and later on, the tall millet frequently made direct laying impossible, but there is no doubt that previous to the war they had regarded indirect laying from concealed positions as undesirable, until the exigencies of active service compelled them to resort to it, and then they regarded it as an unavoidable evil.

It must be remembered in this connection that the Japanese had nothing so good as our present appliances for laying for line behind cover and rapidly changing target; if they had been better equipped in this respect before the war, no doubt they would have practised indirect fire from concealed positions and become more efficient in it.

There is, however, no doubt that it is largely due to the use of indirect fire from concealed positions that the Japanese artillery were on many occasions able to hold their own against the Russian guns, and though latterly there was a greater employment of direct laying, this was partly because the more open nature of the country in some cases rendered it difficult to obtain perfect cover, and partly because the Russians showed more tendency towards concealment, necessitating bolder action on the part of the Japanese in order to find them,

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but chiefly because they learnt by experience that the Russian artillery fire was seldom very deadly.

But, as Major Cadell says with regard to the experiences of the Russo-Japanese War, "what occurred in this war does not really affect my theory, as neither side had effective shields." We will, therefore, dismiss it from the further consideration of the subject.

Now, quoting again from Major Cadell and considering the question of the best position for *shielded* Q.F. guns from the point of view that "the essential attribute of the Q.F. shielded gun is, "that it is capable of remaining in action when exposed to fire," we come to the conclusion (with Major Cadell) if only Q.F. shielded guns are to be considered on both sides, that their tactics should be "to "get into the best position, unseen if possible, and then to fight there, "or advance or retire from it as may be necessary;" that the best position will usually be "at or very near the crest of a hill, rise, or posi-"tion, in fact wherever the best view from the guns can be obtained;" and finally, that "as the Q.F. shielded gun is capable of remaining "in action when exposed to fire, without being destroyed, or even receiving much damage"—it is no use for either side to waste ammunition on such an invulnerable target as the enemy's artillery in position, but that practically all Q.F. artillery fire should be reserved for the enemy's cavalry, infantry, and artillery on the move.

The only objection to accepting these views quite so fully as Major Cadell does is that the guns in such positions can be easily located (i.e. comparatively) and, therefore, form a satisfactory target for:—

(a) Enfilade shrapnel fire.
(b) Howitzer fire.
(c) Frontal common or high explosive shell fire.

As regards (a):—enfilade fire from Q.F. guns will usually be difficult on account of the range of these guns not being sufficient to enable them to occupy positions sufficiently far from the enemy to secure the object in view without being more or less annihilated themselves. But hostile heavy batteries armed with a 60 Pr. gun firing a shrapnel which is effective up to 9,500 yards will constitute a very serious menance under this head, if well led and intelligently handled.

As regards (b):—with the present type of field howitzer, the gun batteries have little to fear, but the introduction of an up-to-date Q.F. howitzer will seriously affect the question, and drive the gun batteries again to seek concealment.

As regards (c):—frontal fire from heavy batteries will again be effective in all probability, as the shrapnel at decisive ranges will pierce the shields of the Q.F. guns, and the high explosive shell will find a comparatively easy target.

The Germans appear to rely largely on common shell from Q.F. guns being effective against shields when they are not in concealed positions and offer a good target, and they are probably right; but whether the damage done to personnel and matériel will be at all commensurate with the amount of ammunition expended, is another matter.

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At present then we may, without misgiving, adopt Major Cadell's text, remembering always, however, that it is in the absence of up-to-date field artillery howitzer and heavy gun batteries in other armies than our own which enables us to do so. To prevent our possible enemies from securing the same advantages, must be especially the rôle of our own heavy batteries, supplemented we hope at no distant date by field batteries armed with a more suitable howitzer than the existing one.

The introduction of shields on the Q.F. guns of the field artillery has brought into greater prominence the value of heavy batteries, and their rôle in the attack of an enemy's field batteries has assumed an added significance and importance which merits the most careful study in its bearing on the conduct of the artillery fight.

It must also be borne in mind that although generally speaking heavy batteries (i.e. gun batteries) as we understand them, form no part of the field army establishments of any foreign army, yet guns and howitzers of a heavier nature than any belonging to the equipments of the field army are in some cases organised in batteries and higher formations, and more or less maintained during a portion of the year on a mobile footing for the purpose of training the personnel to co-operate, if required, with an army in the field.

In a war with a first class power, it may be assumed that under certain conditions guns and howitzers of this nature would be found opposed to us in the field; in such a case we must be prepared to fight our field batteries to a great extent from concealed positions, and consequently we must not relax our efforts to perfect ourselves in this nature of warfare.

Owing to the greater visibility of the flash and of the dust from our 60 Pr. gun, and to its lack of mobility as compared with the Q.F. field gun, the crest position, or just behind the crest, must be regarded as generally unsuitable for our heavy batteries; it seems clear that they should almost invariably "go for complete concealment," as, even if they are out of range for the time being of hostile Q.F. batteries, yet the very fact of the enemy being unable to locate them will add considerably to his difficulties, and in any case the benefits of the crest position as offering facilities for taking advantage of fleeting opportunities, do not apply to heavy batteries in the same way as they do to Q.F. batteries.

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The Ordnance College, Woolwich.

By COLONEL G. R. TOWNSHEND, R.A.

(Commandant Ordnance College).

(By request of the Committee).

It has been suggested that a few notes on the organization of the Ordnance College together with some account of the different classes under instruction, and the various subjects taught there, might be of general interest to Officers who may not have come into contact with this Institution, and the following notes have in consequence been compiled.

A. Duties.

THE duties of the Ordnance College as a technical School of Instruction for the Army may be grouped in three main sections:—

I. The instruction of Officers, Warrant officers, N.C. officers and men of both services and all branches in Materiel, Mathematics and Theoretical Gunnery, Chemistry, Metallurgy, Heat, Electricity, Optics, Machinery, and other allied subjects.

II. The training of Artificers in their various trades.

III. The compiling of various technical treatises and manuals:—e.g. The Treatises on Service Ordnance, Military Carriages, Ammunition, and Explosives, the Text books of Gunnery, Position and Range Finding, Machinery, Electricity, Optics, Store Accounting, and the Handbook for Artificers.

B. Staff and Organization.

The College is in the Department of the Master General of the Ordnance, under the Director of Artillery, and is organized in the following branches:—

In the Red Barracks.

1. Head Quarter Offices, under the Commandant, assisted by an Adjutant and clerical staff.
2. Mathematical Branch. } each under a civilian Professor with
3. Chemical Branch. } Subordinate Staff.
4. Electrical Branch under a military Chief Instructor and a civilian Professor with a military and civil Subordinate Staff.
5. Gunnery Branch under a military Chief Instructor.

In the Royal Military Repository.

6. Artificers Workshops Branch under two military I.O.M. Instructors with civil and military Subordinate Staff.

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7. Position and Range Finding Branch under a military Chief Instructor with military and civil Subordinate Staff.

In the Royal Arsenal.

8.	Gun Branch.	Each under a military Instructor with military Subordinate Staff.
9.	Carriage Branch.	
10.	Ammunition Branch.	
11.	Field Artillery and Small Arms Branch.	

In the Royal Artillery Barracks.

12. Personnel Branch under a Major, a Quarter-Master, and two Subalterns. This branch carries out the administrative work of feeding, clothing and paying the men and boys under instruction, and deals, under the orders of the Commandant, with questions of discipline. All officers undergoing instruction are attached to this branch for administrative purposes. A limited number of officers are supplied with quarters and servants, the remainder are on the lodging list.

The *College Board* is composed of the 13 principal members of the Staff, and meets periodically under the Commandant to decide such questions respecting system and methods of instruction as may be referred to it by him.

C. INSTRUCTION is given in the following subjects:—

1. *Theoretical Gunnery* in conjunction with the associated mathematics. In these subjects the instruction is practically confined to officers going through the Advanced Class and the Ordnance Course, Inspectors of Ordnance machinery, and a class of Infantry officers from the Hythe School of Musketry, which has been recently started.

2. *Chemistry, Metallurgy, Heat, and Microphotography.* Instruction in these subjects is given in the Chemical Laboratories in the Red Barracks. Special attention is paid to the microphotography of metals, of so much use to Inspectors of Steel, and visits are paid periodically to various manufacturing centres, where the different processes connected with the production of steel and other metals and alloys are studied.

3. *Electricity and Optics.* Taught in the Electrical and Optical Laboratories in the Red Barracks. Electricity forms a most important part in the training of almost all the Officers' and N.C. Officers' classes, and the instruction ranges from mathematical theory and applied electrical engineering in the case of the Advanced Class, to simple practical work in Telegraphy and Telephony in the case of classes of men of the Siege and Field Artillery. Visits are paid to various electrical works in the neighbourhood of Woolwich, and occasionally to those in other parts of England, to enable officers to become better acquainted with the latest modern developments of this science. Optics are taught to the Advanced Class, and, to a lesser extent, to the Ordnance and Gunnery Staff Courses.

4. *Machinery and Machine design.* Taught to the Advanced Class, Ordnance and Gunnery Staff Courses by the senior I.O.M. In-

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structor. Owing to the time being limited only general principles can be attempted as a rule, but the Advanced Class Officers are expected to work out a simple design from given data.

5. *Position and Range Finding.* Taught in the R.F. Workshops at the R.M. Repository. Artillery Officers and N.C. Officers are trained as R.F. Instructors in theory and practice. Range Finding Armament Artificers of the A.O. Corps do all their preliminary training and refreshing courses after return from foreign service here, and while under instruction are employed as soon as possible on repairs to service instruments.

6. *Materiél.* The instruction given in the four Arsenal branches is both theoretical and practical. Methods of construction, mechanical details, care and preservation, and inspection are taught. Where an expert specialist has to be trained, facilities are obtained to send the student to the Manufacturing or Inspection branches in the Royal Arsenal, or to Enfield or Waltham Abbey for such further courses as may be required. Students being on the spot can see manufacture and proof in progress, and visits are arranged as may be necessary to the Royal Gunpowder Factory, and the Royal Small Arms Factory. An Assistant Instructor is specially detailed to take classes of Warrant Officers and Civilian Subordinates of the Indian Ordnance Department, sent by the India Office from time to time to become acquainted with the latest changes and improvements in materiél.

7. *The Workshops.* In the Royal Military Repository are Wheelers, Smiths, Fitters, Saddlers, Painters, and Bicycle Repair Shops, where Artificers are taught their trades; also a School and Drawing Office where instruction is given in drawing and elementary machine design by a schoolmaster and a draughtsman. A large number of those under training are boys enlisted by the College, after an educational test, to be trained as artificers; the remainder are sent from service units. Men and boys are at first put on "Practice Work" to learn the use of tools and are paid at rates of ½d. and ¾d. per hour. As soon as they are sufficiently competent they are advanced to "Production Work," and receive working pay at the rate of 2d. per hour. While thus employed they manufacture and repair, under supervision, service equipment, until they are passed into the service or sent back to their units with certificates. The time spent on "Practice Work" varies with the capacity of the individual, but every effort is made to keep this time as short as possible. In the Bicycle repair Shop all the large repairs to service bicycles are carried out, and instruction is given to the Armourers who have to do local repairs at out stations. Instruction is also given in stoking and driving stationary engines, tractors and lorries, and quite recently a motor car has been purchased; this is used for the instruction as chauffeurs of soldiers in their last two years of service, to enable them to obtain employment on discharge or transfer to the Reserve; these classes are well attended. Saddlers are trained in the Royal Dockyard under the orders of the Chief Inspector of General Stores.

The College has now undertaken its own R.E. work, utilizing the men under instruction as far as possible, and obtaining assistance from contractors in those trades which are not taught in the workshops.

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Summary of Principal Courses at Ordnance College.

Name of Course.	Duration.	Subjects of Instruction	Remarks.
Advanced Class.	1 year Jan.—Dec.	Gunnery and Mathematics, Chemistry, Metallurgy, Electricity, Optics, Machine design.	6 or 8 officers selected from Ordnance Course. When qualified obtain *pac.* certificate and are eligible for employment in Manufacturing and Inspection Departments, on Staff of Ordnance College, and in D. of A's Department, War Office.
Ordnance Course.	1 year Jan.—Dec.	Materiel, Gunnery, Army Ordnance duties, Machinery, Chemistry, Electricity, Optics, Heat.	About 18 officers selected by an entrance examination in mathematics and physics. When qualified obtain O. certificate and are eligible for appointments in the A.O.D.
Gunnery Staff Course.	5 months Oct.—March.	Materiel, Gunnery, Electricity, Optics, Machinery, Range Finding, Repairs to Field Equipment,	20 officers R.F.A. and R.G.A., and 40 N.C. officers R.G.A. before going to Shoeburyness.
Young officers R.F.A. and R.G.A.	5 weeks periodically.	Practical Fitting and Smithing in workshops, Store Accounting.	All officers on 1st appointment to R.A. to assist them in supervising work of Battery Artificers.
Junior Class.	3 months periodically.	Materiel, Gunnery, Electricity, Store Accounting, Repairs to Field Equipment. Riding and Gymnastics.	Young officers R.A. who have not passed through the R.M.A. course. Varies according to branch of Regiment to which they belong.
Officers from School of Musketry.	2 months May—July.	Ballistics of Small Arms, Ammunition, Electricity, Chemistry.	10 officers selected by School of Musketry, Hythe, to acquire knowledge in technical considerations affecting Small Arms.
18 pr. & 13 pr. Q.F. Equipment.	3 days periodically.	Practical instruction in Field Equipment.	Officers of R.H.A. and R.F.A. as desired.
I.O.M's Course.	6 months periodically.	Materiel, Gunnery, Chemistry, Electricity, Machinery.	All I.O.M's on first appointment.
Gunnery Lieutenants, R.N.	3 weeks.	Gun inspection and Ammunition.	To obtain Certificate in Examination of Ordnance.
I.O.D.	Varies.	Any Subject taught at College but chiefly materiel.	W.O's and Civil Subordinates I.O.D. at request of India Office.
Master Gunners.	10 months.	Materiel, Electricity, Store Accounting.	N.C.O's R.A. to become eligible for promotion to Master Gunner.
Siege Telegraphists.	6 months Oct.—April.	Telegraphy and Telephony.	1 N.C.O. from each Siege Co. R.G.A. to enable them to instruct in their Companies.
Telephonists.	6 weeks.	Telephony,	17 N.C.O's from R.F.A. to enable them to instruct in their batteries.
Laboratory Foremen, A.O.C.	13 weeks.	Ammunition and Magazine duties.	N.C.O's and men A.O.D. qualifying as Laboratory Foremen.
Naval Armourers.	10 days.	Examination and repair of ordnance.	15 every month.
Armament Artificers, A.O.C.	8 months.	Materiel, Electricity, Machinery, Fitting, Brazing.	Civilian candidates and Military probationers are trained and tested at the College.
Range Finding Artificers, A.O.C.	Varies.	Position and Range Finding, Manufacture and repair.	All R.F. Artificers work at College Workshops on first appointment, and on return from foreign service.

N.B. There are various other courses arranged as required from time to time, but the above table shows all the ordinary courses.

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Summary of Artificers Courses at Ordnance College Workshops.

Nature of Course.	Duration.	Remarks.
Carriage Smiths, R.F.A.	54 weeks.	These periods represent a maximum in ordinary cases, and are reduced for men of good capabilities.
,, R.G.A. Smiths	69 ,,	
,, R.G.A. Fitters	76 ,,	
,, R.E.	46 ,,	
,, Cav'y. & Inf'y.	50 ,,	
,, A.S.C.	50 ,,	
,, A.O.C.	50 ,,	
Wheelers, R.A. & R.M.A.	68 ,,	
,, R.E.	43 ,,	
,, Cavalry, Infantry, & R.M.L.I.	59 ,,	
,, A.S.C.	59 ,,	
,, A.O.C,	59 ,,	
Battery Fitters, R.F.A.	Varies.	Depends on the man's previous skill in fitting. Only very few men have been found with sufficient skill to make it worth while training them. The supply is to be maintained in future from boys.
Boys, R.A. & A.S.C. Fitters, Smiths and Wheelers.	About 4 years.	After 6 months general instruction the boy's trade is selected according to his natural bent.

Numbers trained at Ordnance College during 1906:— 299 Officers, 1459 other ranks; total 1758.

Average number always under instruction:— 45 Officers, 617 other ranks; total 662.

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Firing over Friendly Infantry.

By LIEUT.-COLONEL R. G. STRANGE, R.F.A.

THE combined attack of artillery and infantry on a position is seldom carried out at manœuvres, with ball ammunition and live shell, in a manner at all approaching the ordinary procedure in actual war.

Fear of accident to the attacking infantry usually prohibits real combination in the action of the two arms.

A brief account of the combined attack of an infantry brigade and two field batteries, near Meerut, carried out as nearly as possible under active service conditions, may be of interest.

The first day was occupied in preliminary reconnaissance and in driving in the enemy's outposts.

On the second day, the two batteries took up a covered position at a range of about 3,000 yards from the position, which was about half a mile long, and consisted of infantry trenches, with guns in concealed positions. Overhead cover was provided in most of the trenches. Dummies were wooden head and shoulders, and "Chatties." Wire entanglements, and other obstacles had been constructed in front of the position. The hostile guns were dispersed behind cover, on each flank.

The country between the guns and the position consisted of low sandy hills, with wide nullahs, affording good cover for the infantry advance. No sign of the enemy could be seen from the Artillery Commander's position. A balloon was, however, available, and from it an officer (R.A.) at a height of 800 feet, made out the hostile guns and directed the batteries on to them, and telephoned results.

The Artillery Commander's position 800 yards in front of the guns and slightly to a flank, was connected by telephones, with the batteries, the balloon, the General Officer Commanding, and the Officer Commanding centre battalion of the attacking infantry.

The infantry firing lines and supports assembled under cover from the enemy, about 400 yards in front of the batteries, and advanced direct to the attack. The batteries continued to fire over their heads, and ranged on, and engaged, various targets. The infantry attack was eventually supposed to be checked by the enemy, and the reserves, which had been assembled in rear of the batteries, advanced through the guns to support.

On the same evening, after dark, the infantry laid out lines of

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advance by compass bearings, and advanced during the night to within 500 yards of the position where they entrenched. Fire was opened at dawn by artillery and infantry, and the position finally taken by assault. The artillery fire on this day was against targets to which range and fuze had been found the previous day, the balloon being used for observation. Artillery fire ceased at the order to assault. The two batteries were firing for the last time, with the 15 Pr. Each fired about 170 rounds. Two prematures occurred, the first when the infantry lines were about 800 yards in front of the batteries. The empty case caused some little alarm. On the second occasion the infantry were well in advance.

The infantry firing lines were in the direct lines of fire of the batteries.

They were at first inclined to duck at the sound of the shell overhead, but soon got accustomed to it. Ranges varied from 2,700 to 3,000 yards.

The risk to the infantry from overhead artillery fire appears to be very slight. Their first advance of 800 or 1,000 yards from the guns being the most dangerous period. The longer the range of course the less the risk. At short ranges the trajectory of the 18 Pr. is higher than the 15 Pr., and we may expect the new fuze to be more reliable than Nos. 56 and 60.

The advance of the infantry through firing guns requires practice, so as to check the fire as little as possible.

It appears desirable to practice in peace the combination of artillery and infantry as in war, and the instruction derived would be worth the slight risk incurred. This risk is probably far less with the new equipment than with the 15 Pr.

The officers of all arms present were agreed that these operations approximated as nearly as possible to the conditions of real warfare.

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A Method of employing two limbers as an Observing Station.

By CAPTAIN C. N. BUZZARD, R.G.A.

THE accompanying photographs show a method of constructing an observation post with two limbers, which has been tried and found of use. The limbers used were those belonging to a 6 inch B.L. howitzer battery, but the method could probablv be adapted, with some modifications, to other patterns of limbers in the service.

The advantages claimed for the arrangement are as follows:—

(1). Considerable height. The eye of the observer is from 16 to 20 feet above the ground.

(2). The structure can be arranged in a few minutes.

(3). Only stores carried in the 6-in. howitzer equipment are used.

(4). The structure complete can be moved about at the cost of a little paint, though it is perhaps preferable for the observer to descend on to terra firma before movement commences.

(5). The arrangement can be taken to pieces in a very short time.

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The method of arranging the limbers can readily be understood from the photographs. No. 2 limber is brought up in rear of No. 1, with the shafts resting on the latter. The wheels of No. 2 are brought hard up against the back of No. 1.

Two "shifting ropes" (used in the siege artillery in pulling a howitzer from the travelling to the firing position) are fastened together. One end is made fast round the off shaft of No. 1 limber, then passed twice through the rings on the shafts of No. 2 limber, thence round the limber (No. 2), underneath, and made fast to the splinter bar of No. 1 limber on the near side.

The wheels are scotched up with stones, &c., and two iron pointed levers are jammed between the two limbers, thus causing rigidity. The corners of the angle iron used in the construction of the beds of the limbers form convenient receptacles for the ends of the levers.

The end of the prop on one of the shafts of No. 2 limber is made fast to the other shaft, forming a step.

A lower step may be constructed with handspike and lashing for the convenience of those who dislike gymnastics.

One photograph shows an officer observing with field glasses, and the other, a line of fire is being picked up with a director which is fastened to the top of a shaft with the straps of the director.

Perhaps a similar structure might be made with limbers fitted for pole draught, if a few small fittings were carried.

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Methods of estimating "Displacement," and for reckoning "Displacement Differences" for Artillery in the Field.

By MAJOR J. G. GEDDES, R.F.A.

I. Introduction.

Displacement and displacement difference defined:—

The term "displacement" as applied to artillery in the field is apt to be misunderstood. In "Field Artillery Training" no definition of the term "displacement" is given. In chapter IV. "Field Artillery Training," Section 26, the term "displacement difference" is described, and from this explanation, we may infer what "displacement" is taken to mean.

It is quite possible that what is meant by "displacement" by artillery in the field differs from what is meant by the term with Fortress or Siege Artillery. If this is so, the matter should be remedied and the term "displacement" should mean the same to artillery men of every branch of the Regiment.

If the term "displacement" is applied by artillery in the field to something which is not displacement, another name should be adopted.

Displacement:—

With reference to "Field Artillery Training," Chapter IV., Section 26, "displacement" may be taken to mean the perpendicular distance between two parallel lines, drawn through two given points.

Displacement difference, as defined by the same Section of "Field Artillery Training," may be taken to mean the angle through which one of these parallel lines must be moved (or deflected) *inwards* to make it meet a given point on the other line.

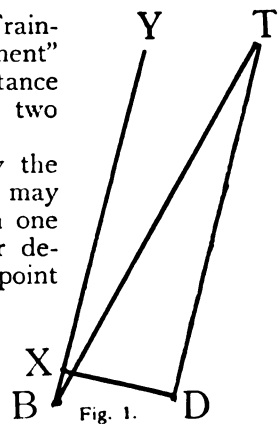

Fig. 1.

Example:—

Let T.D.B. be three given points.

Join DT, and through B draw BY parallel to DT.

From D draw DX perpendicular to BY meeting BY at X.

Join BT.

The distance DX is the *displacement* between D and B.

The angle TBY is the *displacement difference.*

In accordance with the relative positions of T, D and B, the perpendicular DX may fall on YB or in prolongation of YB.

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Battery angle:—

In Chapter IV., Section 41. (ii) the term " Battery angle " is defined.

The most simple manner at arriving at the "Battery angle" is to do so by means of the Field Plotter. But in cases where the base DB (where D is the observing station) is short, that is to say within 800 yards, the battery angle it is thought, can be calculated with sufficient accuracy by means of a table of displacement differences, and time saved in taking the distance D to B by range takers and setting the plotter.

In order to do this a calculation of the displacement is necessary.

Again in firing from concealed positions where the observer is a long distance away from the battery, the angle through which lines of fire must be changed in order to bring guns into the direction of the new target may be worked out by the plotter. But in cases where the observer is within 800 yards of the battery, the observer can estimate the required angle for the guns with sufficient accuracy by means of a table of displacement differences and the system given in F.A.T., Chap. IV., Sect. 26, without using the plotter and save time. But in order to do this the observer must have some ready means at hand for estimating "displacement." In change of target a double displacement will in most cases be necessary.

In a previous article contained in the R.A. Journal," No. 11, Vol. XXXIII., February, 1907, we dealt with the employment of a table of "displacement differences" in obtaining line of fire for a battery in a concealed position.

The table quoted was as follows:—

Range.	100	200	300	400	500	Displacement.
2000	3°	6°	9°	12°	15°	
2500	2½°	5°	7°	9½°	12°	
3000	2°	4°	6°	8°	10°	
3500	1½°	3°	5°	7°	8°	
4000	1½°	3°	4½°	6°	7½°	
4500	1½°	2½°	4°	5°	6°	

The above table may be expanded to any range or any displacement, and should be carried in the pocket book of all officers.

(NOTE.—A convenient pocket book is one of the pattern "found at once" note books which can be procured at any stationers and can be carried in the left breast pocket of the service jacket).

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Salvage of time is a great factor in all operations in firing from concealed positions.

The higher the training of the battery, the less time will be required in obtaining line of fire from a concealed position, or in changing fire on to a new target.

A correct and rapid estimation of displacement in cases where the base (DB) is not accurately measured by the range takers and the plotter is not used for the solution of triangles, is the object of the two following systems.

In all cases where the displacement is difficult to estimate, the "base" should be measured by range takers and the results arrived at by means of the plotter.

Where time admits, " battery angles," and angles for change of target should be checked by means of the plotter if obtained by means of either of the two systems suggested.

In any case it is suggested that definitions should appear in " Field Artillery Training " of the terms " Displacement," " Displacement difference," "Base" and "Battery angle" amongst " Definitions."

It will be noticed that the systems suggested only apply to the training of *officers*. The actual procedure with the guns can be carried out by any Reservist who has been "dismissed" in Section Gun Drill, as the *method* of obtaining line of fire to a target, or a change of target in no way affects the gun detachments.

II. Systems for estimating displacement.

Now in order to calculate "displacement difference" with any degree of success, without using the Plotter, an individual must be able to measure or estimate the displacement.

System for estimating displacement by eye by the observing officer:—

To estimate displacement in the field for distances even up to 500 yards with any degree of accuracy *by eye* requires practice.

To train officers to do this, the following system has been found useful.

Two N.C.O's each having a director, four signallers, and the range takers should be taken out, either mounted or dismounted according to circumstances. The officers should in all cases be mounted.

One director and two signallers and the range takers, represent the Battery Commander's (or observer's) party. The other director and two signallers represent the battery.

A target is selected, and positions for the battery and observer's party within semaphore signalling distance, are chosen. The target should be visible from each party.

Calculating the battery angle:—

The observing officer when he knows the range, and angle between the target T, and his director D, and the battery director B, *estimates the displacement by eye*, and from these data and the table given in Chapter III., F.A.T., Section 21 (i.), or by means of a table of "displacement differences" ascertains the " battery angle."

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The "battery angle" is sent by telephone or by semaphore to the party representing the battery, and this angle is laid off the observer's director by the N.C.O. with the battery director.

Checking error in line of fire obtained:—

The observer now gallops to the battery director and ascertains his error. With practice the error should not exceed 1°, and by means of the above methods a battery angle is very quickly found.

Some officers are able to do this operation much quicker and more accurately than others. A quick eye, and *training in the field* is the method to attain accuracy.

Objection to this system:—

The objection to the above system is that errors arise most frequently from a wrong estimation of displacement. The observer estimates displacement, by measuring a distance by his eye from a *known point* (his director), to an *imaginary point.* For unless the angle TDB is 90°, the point X in the figure 1, will be imaginary. Therefore, to estimate displacement by this method, a feat of mental gymnastics has to be accomplished.

When a change of target is ordered, which as a rule entails a double calculation of displacement, a double feat of mental gymnastics is required.

Some officers find much difficulty in training their minds to cope with such a problem, while on the other hand many officers can not only calculate a "battery angle" from such a position, by estimating displacement by eye with accuracy, but can order a switch of fire to a battery which will bring lines of fire on to a new target (involving double displacement difference) with surprising accuracy and celerity.

The whole operation is a matter of training, and mental capacity of estimating displacements from the observer's director to the imaginary point X.

Double displacement:—

Some officers assert that "double displacement" is such an insurmountable fence that it must be avoided at any cost. It can only be avoided either by changing the position of the observing station or by changing the position of the battery, or by calculating a new battery angle, or some such device.

It would, therefore, appear, that the mental worry, and loss of time entailed in avoiding double displacement, is far worse than the operation itself. " Harden your heart and ride at it," would seem sound advice on this occasion!

A study of Chap. IV., Sect. 26, " Field Artillery Training," will help one out.

III. System of Estimating Displacement from Measured Base.

In order to overcome the difficulty experienced in attempting to estimate the distance between a known point and an imaginary

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point, the following scheme is suggested, viz: *To find a practical rule* (or short table which can be carried in the pocket book, or retained in the mind) whereby displacement can be estimated *with relation to the distance between the fixed points D* (the observer's director) *and B* (the battery director), *usually termed the " base."*

The distance DB can be measured either by a man on foot, or by a mounted man near enough for purposes of estimating displacement, and this can be done by the observer's signallers during reconnaissance.

If the angle TDB (vide figure 1) is 90°, the displacement DX will be equal to DB. In *all* other positions for B, at the distance DB from D, *the displacement DX will be less than DB.* The nearer the angle TDB approaches 0° or 180° the less will be the displacement DX until it arrives at zero, in which case B will be on the line TD or in prolongation of TD.

We assume that D and B are within semaphore signalling distance of each other. In other words the distance DB will be less than 800 yards. This being so, on account of the "danger angle" we may assume that with gun batteries the position of B will be such that the angle TDB is never greater than 135°, or else the observing party will be within the " danger angle." This of course is purely a practice camp, or peace condition, and refers especially to gun batteries.

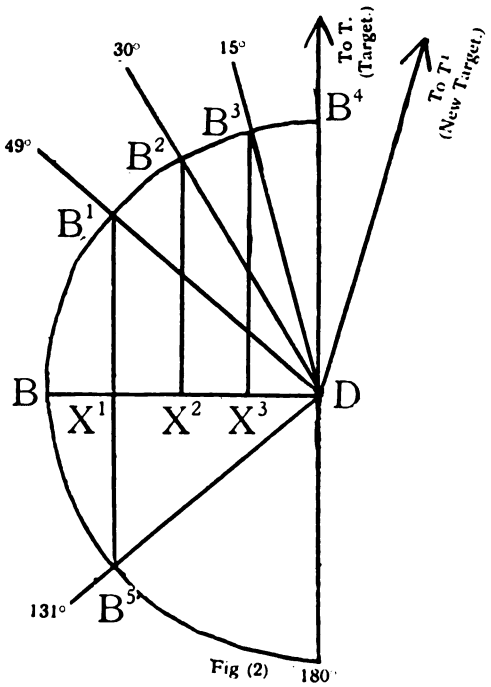

Fig (2)

But even with howitzer batteries, Practice Camp Staff Officers are apt (and rightly so) to be squeamish about allowing an officer 500 or 600 yards in front of the battery to remain within the " danger angle." Therefore, for purposes of illustrating this scheme, we suppose that the angle TDB will never be greater than 130° right or left of the line DT.

Let T be the target.

Let D be the observer's director.

Let B. B^1. B^2. B^3. B^4. B^5. be possible positions for the battery director at a distance DB (within semaphore signalling distance) from D. with D as centre and DB as radius describe a circle.

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All possible positions for B at a distance DB from D will lie in the radius of this circle.

From B^1 B^2 B^3 draw perpendiculars B^1X^1 B^2X^2 B^3X^3 to BD, meeting DB at X^1 X^2 X^3.

Produce B^1X^1 to B^5.

Join B^1 B^2 B^3 B^5 with D.

Let the angle $TDB^1 = 49°$ $TDB^2 = 30°$ $TDB^3 = 15°$. The angle $TDB^5 = 131°$.

By means of a table of natural cosines, the distances DX^1 DX^2 DX^3 will be found to be ¾, ½, ¼, of DB respectively.

Since B^1X^1 B^2X^2 B^3X^3 *are parallel* to DT and DX^1 DX^2 DX^3 *are perpendicular* to these parallel lines, DX^1 DX^2 DX^3 are *displacements* for batteries in the positions B^1, B^2, B^3, with relation to the positions T and D.

In other words. If the angle TDB = 90° accept DB as the displacement.

If the angle TDB approaches is 50° or 130° take ¾ DB as the displacement.

If the angle TDB approaches 30° the displacement will be ½ DB.

If the angle TDB approaches 15° the displacement will be ¼ DB.

From the above the following table may be complied and carried in the note book.

TABLE I.

		approximately to			
TDB.	55° to 125°	50° or 130°	30°	15°	10° to 0°
Displacement.	accept DB.	¾ DB.	½ DB	¼ DB	give none.

For intermediate angles accept displacement for the *nearest* angle given in the table, and the result for practical purposes will be found good enough.

EXAMPLES.

Example I.:—

The angle TDB is measured at 115°. Accept the distance ΓB as displacement and calculate the battery angle from it by means of a table of "displacement differences" as has already been described.

Example II.:—

The angle TDB = 52°.

Take ¾ DB as displacement for calculation of the battery angle.

Example III.:—

The angle TDB = 27°.

Take ½ DB as displacement.

Example IV.:—

The angle TDB = 20°.

Take ¼ DB as displacement, as 20° is nearer to 15° than to 30°.

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Example V.:—

The angle TDB = 7°.
Give no displacement.

Change of target:—

In changing target, where T^1 is the new target, it will be necessary to measure the angle T^1DB to obtain displacement for the new target.

The "battery angle" can be calculated from this by the procedure given in " Field Artillery Training," Chap. IV., Sect. 26, by calculating the displacement difference for the old target and that for the new target, (which are in reality apex angles) and procedure is given in the section quoted above.

IV. Conclusion.

On paper the procedure has taken a long time to describe, which no doubt could have been curtailed, but the above procedure if tested in the field, will be found to attain the desired result accurately and rapidly. If by its use the time spent in obtaining line of fire by a battery in a concealed position (from which observation of fire can only be effected from a point some distance away) can be quickened up a move in the right direction will have been made, and the object of this, somewhat lengthy paper, fulfilled.

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Remarks on Captain J. A. FitzGibbon's paper on

"The Royal Artillery in the Siege of Gibraltar, 1779-1783."

NOTE.—The following letters convey valuable information as well as correcting mistakes which had crept into the original paper.—*J.F.C.*

Colonel H. W. L. Hime writes:—

Dear Captain FitzGibbon,

In your paper on the "R.A. in the Siege of Gibraltar," you mention that the proposal to fire 5½″ mortar shell from guns, with short fuzes, was "made by an artillery officer." I always thought so until I began to write the section on shrapnel shell for my "Gunpowder and Ammunition," pp. 208 and 209, I then found that without doubt this grand proposal was made by Captain Mercier, 39th Regt., who (so far as I could gather) was treated very ungenerously by the R.A.,—though I did not say so in my book.

It is time we should give this man his due, as I am sure you will agree.

I thought it better to write to you than to raise the question myself in the R.A.I. Journal, or the Military newspapers; as you would thus have the opportunity (which I have no doubt you will take) of restoring to a dead man his undoubted rights.

Kew, 28/2/07.

The O.C. 100 Company, R.G.A. writes:—

Sir,

In the "Journal of the Royal Artillery" for February, 1907, appears an article headed "The Royal Artillery in the Siege of Gibraltar, 1779-83," by Captain J. A. FitzGibbon, R.G.A.

In this article on page 488 is a list of the units which took part in the siege, and Captain Reeves, R.A., is mentioned but the words added "Company not known." There is no doubt that this was 5 Company, 2nd Battalion, now 100 Company, R.G.A.

In my Digest of Services of 100 Company, R.G.A., which was 5 Company, 2nd Battalion, appears the following:—

"No. 5 with Nos. 1, 2, 3, and 4 Companies, 2nd Battalion were present and the only artillery employed in the Defence of Gibraltar during the siege of that garrison which was besieged by the combined

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forces of France and Spain, and was also blockaded by sea from 21st June, 1779, to 3rd February, 1783." This is certified by Major R. H. Murdoch, a/Superintendent of Records.

Besides this, in Captain FitzGibbon's account on page 485 mention is made of Major Lewis, and on page 486 of Captain Reeves. In my Nominal Roll of Officers and N.C.O's of 5 Company, 2nd Battalion who served during the Siege of Gibraltar there is a Captain George Lewis promoted Major who apparently commanded the Company, and of Captain John Reeves who was killed on the 13th September, 1782; this latter agreeing with Captain FitzGibbon's account.

Can the necessary correction be made?

Malta, 5/3/07. J. C. Burnett, D.S.O., Major, R.G.A.

Major J. H. Leslie writes:—

Remarks upon a paper entitled The Royal Artillery in the Siege of Gibraltar, 1779-83," by Captain J. A. FitzGibbon, which appeared in the "Journal of the Royal Artillery," Vol. XXXIII, pages 480-8.

1. Page 480, para. 2. "The garrison consisted of . . . . "6 companies of artillery."

Duncan in his "History of the R.A."—3rd edition—states on pp. 271-2, that the number of companies was *five*.

In the Dickson Memoirs—series "A"—p. 107 (July 3, 1779) it is stated that "The Artillery in garrison were only *five* companies."

See also Kane's List of Officers, R.A., 4th edition, 1900—page 207.

The statement that there were six companies has possibly arisen by assuming that J. Reeves—see p. 488 of FitzGibbon's paper—commanded a company.

At the commencement of the siege in 1779, Reeves—No. 427, R.A.—was a 1st Lieutenant in Lewis's company, and was promoted to the rank of Captain-Lieutenant in the same company on November 11, 1779. See Kane's list and MSS. muster rolls in the R.A. Record Office.

Reeves was killed in action on September 13, 1782.

2. Page 481, para. 7. "The Governor of the Fortress was "General Elliot."

As this is a purely Artillery paper, it might be noted, I think, that General George Augustus Elliott had previously (though only for a short period) served in the Royal Artillery—No. 39 in Kane's List.

He was created Lord Heathfield, Baron Gibraltar, on July 6, 1787, but the peerage became extinct in 1813 on the death of the 2nd Baron.

He was appointed a Knight of the Bath—K.B., not K.C.B., as stated on page 487—in 1783. At that time there was only one class of the order and members were styled K.B.

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3. Page 483, last para. but one. In Volume XIV., page 248, of the "Proceedings of the R.A. Institution," there is an illustration of G. F. Koehler's "Depression Carriage."

4. Page 487, para. 9. The casualties here given do not agree with those given in Duncan's History—pp. 273-4,—nor with the details given in the Dickson Memoirs—pp. 109 and 123. The matter is, perhaps, not of very great importance.

Two Officers only —not three—were killed, viz.: Capt. Lieut. J. Reeves, as above stated, and 2nd Lieutenant John Grumley—No. 631, R.A.—both on September 13, 1782 (See Kane's list).

Lieutenant Colonel Abraham Tovey (No. 92, R.A.) *died* during the siege—November 27, 1781.

5. Page 488, para. 2. "Colonel Tovey, R.A., succeeded by "Colonel Godwin."

This is a mistake. Tovey succeeded Godwin, and when Tovey died in 1781, he was succeeded by Major George Lewis—No. 176, R.A., See Duncan's History, Volume 1, p. 272.

6. To the bibliography of the siege of Gibraltar might be added a paper which appeared in Volume XXII.—page 457—of the "Proceedings, R.A. Institution," contributed by Brevet Lieut.-Col. J. Adye, R.A.; and the fact that in the Museum of Artillery in the Rotunda, at Woolwich, there is—Class XXVI., No. 1 exhibit—a "Model of Gibraltar, with the works erected against the Fortress "during the siege of 1781."

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A combined Observation Ladder and Director.

By CAPTAIN H. E. MOLESWORTH, R.G.A.

AT the beginning of last drill season, I had made up by the battery artificers, an observation ladder for use in flat country, where the presence of crops or scrub jungle interfered with a clear view of the target.

I found that a ladder, giving a command of about 10 feet, was quite sufficient to bring the battery commander's line of vision above the undergrowth usually found.

I used this ladder all through last cold weather, and found it of considerable assistance in observing.

The following difficulty, however, always presented itself; viz. although the target and the battery were clearly visible from the top of the ladder by the battery commander, he was unable to lay out the line of fire by the director, as of course the latter being on the same level as the guns, the line of sight from it to the target was nearly always interfered with. There seemed no reason, however, against the ladder itself acting as a director-stand, and the line of fire of the guns being laid out from a director fixed to the top of it.

The following is a description of the combined instrument which has been made up. I see no reason against it being satisfactory as a director. The protractor reads to half degrees and has a good deal bigger diameter than the graduated part of the service director stand.

The ladder consists of the ladder proper with two supports in the form of a step ladder, the supports splaying outwards and being jointed to the top of the ladder. The supports and ladder are joined to one another half way down by light iron bars, which when hooked in, render the whole rigid.

Both the ladder and its supports are in two pieces, the upper pieces fitting into the lower in a similar way to the poles of a Cabul tent.

The whole is made of male bamboos about 1 inch in diameter, the rungs being iron bars about ¼ inch in diameter.

In front, above the light iron bar joining the two supports there is a stouter bar for the B.C. to stand on when laying out his line of fire, if to the rear.

The director disc is fixed to the top of the ladder through the sides by thumb screws, which when unclamped allow of it revolving about a horizontal axis.

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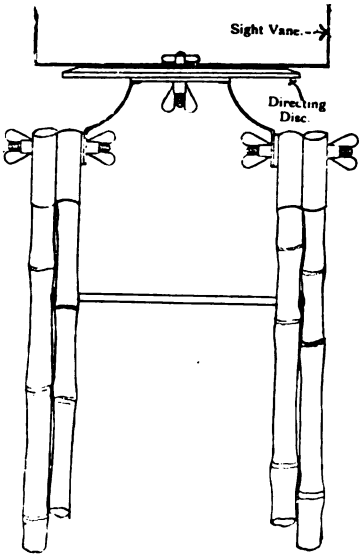
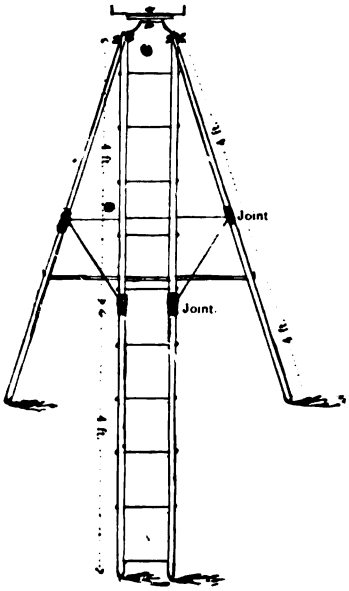
At the same time the disc and sight vane can revolve when unclamped freely round the centre independently, being clamped at the required divisions by thumb screws below and above respectively.

The director disc was made by soldering a 10 inch brass protractor on to a corresponding thin brass disc.

The ladder folds up into a load about four feet long by 18 inches wide and weighs 27½ lbs. the directing disc weighs 4½ lbs.

The load is too awkward to be carried by a mounted man but I found that using a packsaddle on a spare horse the whole of the B.C's paraphernalia, ladder, telescope, and stand, megaphone and plotter, could be brought along at a gallop led by a horseholder together with the B.C's assistant. It all arrived together instead of being brought up by two or three different members of the battery commander's staff.





Corrigenda to "R.A. Journal," Vol. XXXIV., Nos. 4 and 5.

Page 146, line 16. *For* "12 Battalions" *read* "6 Battalions."

Page 166, middle illustration. *For* " Siege " *read* " Battery."

Page 167, line 17 . *For* "distributed" *read* "disbanded."

Page 189, line 12. *For* "aiming points" *read* "two aiming posts."

Page 189, between lines 21 and 22 insert, "the battery is found by method 3, in this case the range from the"

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"DUNCAN" COMMENDED ESSAY, 1907.*

"To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations, and what rules should govern their tactical employment?

By MAJOR K. K. KNAPP, R.G.A.

"FESTINA LENTE."

THE recent re-armament of our field artillery with quick-firing guns marks the great development which has taken place in the last few years, in the construction of artillery material, and, as judging by recent events, these Q.F. equipments are likely to exercise a revolutionary effect upon modern methods of warfare, it has become imperative to carefully consider how far other parts of our machinery of war are suited to the new conditions.

It is unfortunate that it should be necessary to re-open the subject of heavy artillery armament, just at the time when the batteries at home are being rearmed with a heavy gun of the most modern type; but it is unavoidable, since the question now is, whether guns are any longer a necessary or suitable equipment for heavy artillery.

The decision to equip the heavy batteries with the 5″ B.L. (60 Pr.) gun was a result of our experiences in the South African War, and there is little doubt that while the field artillery was armed with the 15 Pr., a long range heavy gun was a necessary equipment of heavy artillery. For all long range work had then to be carried out by the heavy batteries, and for this purpose heavy guns with their low trajectory fire and long ranging power were essential, even though they were not so suitable, as howitzers would have been, for some of the other duties of the heavy artillery.

Now, however, the comparatively short ranging 15 Pr. has given place to the 18½ Pr. quick firing field gun, which is effective up to 7,500 yards,—a range sufficient for all practical purposes in any theatre of war—and consequently, much of the work which has hitherto been assigned to the heavy guns on account of their long ranging powers, will in future be carried out by the field artillery.

For instance, the long range fire of the field guns can now be utilized

" to bring enfilade or cross fire to bear on the enemy's position
" and to sweep with fire as large an area as possible within that
" position; . . . . If well protected and placed on the
" flanks of a defensive position in an open country, their long
" range fire may compel a turning movement to move on so wide

* The three Commended Essays were not placed in order of merit by the Judges nor are they published in any particular order save as expediency suggests—Secretary, R.A.I.

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"an arc, that time, valuable to the defenders, may be gained." ("Field Artillery Training," 1906, p. 222.—Heavy Artillery).

"They should be sufficient to protect the front and flanks of an "entrenched position, to prevent the enemy's guns from coming "into action at short ranges and to force his infantry to extend, "while still at a distance." ("Combined Training," 1906, p. 130.—Action of the Artillery).

In covering a retirement their long range fire "would be espec-"ially effective, more particularly if there are positions in rear "of, and overlooking the main position." ("Field Artillery Training," 1906, p. 231.—Artillery in the defence).

It might, at first sight, be urged against the employment of field artillery for the purposes here advocated, that the fire of heavy artillery is more likely to produce the desired result than the fire of the less powerful field guns, and that the longer range of the heavy guns renders their employment preferable, but this is not really the case. For although the heavy guns are capable of great fire effect up to ranges of 10,000 yards, yet, as "Combined Training" points out, the difficulty which attends the observation of fire at such distant ranges, renders it undesirable as a general rule, to employ such distant fire, and the following comparison shows that, up to the sufficient range of 7,500 yards, the actual and moral effect of the shrapnel fire of the Q.F. field guns should always be greater than that of the 5″ B.L. (60 Pr.) guns.

For three 18½ Pr. shrapnel shell contain 1092 bullets as compared with the 990 bullets of the 60 Pr. shrapnel, and more than three rounds of 18½ Pr. ammunition can be carried into the field for every round of the 60 Pr. ammunition; so in carrying out any task the field guns can fire more than three times as many shells as the 5″ B.L. (60 Pr.) guns without any greater proportionate expenditure of ammunition, and the effect of their fire should be greater on account of the larger number of bullets which are poured upon the enemy's position. Moreover, where the number of rounds expended is large, the sweeping and searching methods of fire can be applied, and so the fire of the field guns can be better distributed over an area of ground than that of the heavy guns, with a relatively equivalent number of rounds. And as it is an established fact that the moral effect of losses occasioned by fire in any particular part of the battlefield during a short space of time, is much greater than that of an equal number of casualties which are spread over a longer period, the moral effect of the fire of the field artillery should be greater on account of the rapid rate of fire which they can develop with their Q.F. guns. It is, therefore, I think, necessary to acknowledge that for the execution of each and every part of the above described rôle, the field guns should be able to produce the desired result more thoroughly, and in a shorter time, than the slower firing heavy guns, which are further handicapped by their limited mobility.

The question then is, how far are heavy guns suitable for the other work in which heavy artillery will be tactically employed? To answer this question satisfactorily, it is necessary to consider it in respect of each distinct nature of work.

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According to our latest text books of training, heavy artillery is to be employed

(1) "To silence at distant ranges hostile guns, which command "lines of approach." ("Combined Training," 1906, p. 117).

When guns were not provided with shields, and detachments had little protection against frontal fire, heavy guns were capable of producing great effect upon hostile guns at distant ranges, and so were a real support to the field artillery, while the latter was armed with guns of only moderate ranging powers. But circumstances have changed with the introduction of quick firing equipments. The demoralizing effect of the fire of Q.F. field guns upon batteries in action has necessitated the adoption of shields as a means of protection for gun detachments, and since the bullets of even heavy shrapnel shell have not sufficient striking energy to penetrate gun shields at ordinary ranges, direct fire with shrapnel shell will not in future produce much effect upon hostile artillery. Gun batteries will, therefore, be reduced to trying to obtain direct hits upon material with percussion or high explosive shell, unless opportunities can be obtained for enfilading the enemy's artillery positions. These opportunities may occasionally offer, but it will seldom be possible to make much use of such chances without occupying a position, exposed on a flank or too far forward to be safe; and judging from the Russo-Japanese War, it is vain to think that hostile guns can be silenced by the destruction of material, for the effect produced by artillery fire upon artillery material in Manchuria was a negligible quantity.

In future, therefore, a heavy artillery weapon which affords the means of attacking the personnel of batteries behind their gun shields, will render more valuable assistance to the field guns in their duel with the hostile artillery than the present gun equipment.

(2) "To support the firing line in the final stages of the assault." ("Combined Training," 1906, p. 117).

There can be no doubt that the curved fire of howitzers is much more suitable for closely supporting the Infantry than the low trajectory direct fire of high velocity guns, even though the latter fire lyddite shell, as advocated in "Field Artillery Training," 1906, pp. 220-1. Effective support can only be given if fire is maintained upon the enemy's position over the heads of the attacking troops up to the latest possible moment in the assault; and this can only be done with safety by means of high angle fire.

(3) In the attack of "localities, buildings and entrenchments." ("Field Artillery Training," 1906, p. 222).

Under "localities" must be considered high woods and concealed positions. To produce any effect inside a wood, it is necessary to burst shell there in such a way as to deprive the troops in occupation of any certain protection from the trees, and this can only be done effectively by high angle fire. For shelter can easily be obtained against the high explosive shell of the heavy guns, which with their low trajectory will not penetrate very far into the wood; whereas trees would afford little protection against the searching and des-

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tructive effect of the fire of heavy howitzers, and the moral effect of powerful high explosive shell, dropping into and bursting inside the wood, could not fail to be terrifying to the occupants.

Similarly the direct fire of heavy guns would be of little avail against troops in concealed positions. To attack these with any hope of success, the searching effect of high angle fire is necessary.

Against buildings and villages also, heavy howitzers, with their powerful shell and the steep angle of descent of these projectiles, will produce greater destructive effect tnan heavy guns, and as entrenchments and field works are more easily made defensible against the direct fire of guns than against the curved fire of howitzers, the latter are the most suitable weapons to employ in the attack of field fortifications.

(4) "To take part in the attack of permanent or semi-permanent "works, to bombard buildings, docks, &c., or even to fire on "vessels in defended harbours." ("Field Artillery Training," 1906, p. 236).

It follows from the foregoing that heavy howitzers will be the most suitable weapons to co-operate with the siege artillery in the attack upon permanent works, &c., and the best method of attacking vessels in defended harbours is with high explosive shell by means of high angle fire.

Thus it appears that heavy howitzers are, in every way now, more suitable for all the other natures of work assigned to the heavy artillery in the regulations for its tactical employment; and as the guns with which the field artillery has recently been rearmed are powerful enough to do the long range work for which heavy guns have hitherto been required, the *raison d'être* of heavy guns has ceased to exist. Therefore, it would seem wise to rearm our heavy artillery with a weapon more suited to the present requirements, under which great shell power and high angle fire up to a sufficient range, rather than long range fire and great shell power as defined in "Field Artillery Training," are the chief characteristics required of mobile heavy artillery.

We must not be slow in recognizing that high angle fire has assumed additional importance as a direct result of the influence of Q.F. equipment upon the tactical conduct of battles. For the actual and moral effect of the fire of Q.F. guns upon personnel in the open is so great, that troops whether in attack or defence, will in future be obliged to make the utmost use of cover, consistment with the accomplishment of the task they have in hand; and where no natural cover exists, protection must be improvised by means of field fortification.

As the importance and use of field fortification increases, so does the necessity for howitzer fire. For the direct fire of field and heavy guns has so low a trajectory, that it has little effect upon troops in trenches or behind good cover; whereas the high angle fire of howitzers with its steep angle of descent has great searching power, and natural or improvised cover, trenches, the interior of field works, &c., can be brought under fire by this means. Howitzers are thus able to give great support to Q.F. field guns by inflicting loss upon

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the enemy in places where the direct fire of guns will not reach them, and their fire will often provide for Q.F. guns the opportunity which the latter require, by rendering the enemy's trenches untenable, and so driving the troops defending them to seek safety in the open.

So heavy artillery, armed with a heavy howitzer capable of great fire effect up to a range of 7,500 yards, would prove a powerful and much needed auxiliary of the Q.F. field guns; and that nature of equipment seems to be the most suited to the special rôle of heavy artillery under the new conditions of warfare.

"But," some critics may say, "if the arguments are sound, which "have been used above to show that long range quick firing field "guns can now do all that heavy guns have hitherto been required "for, and do it better, surely the same may be applied to this ques-"tion of howitzers, and as soon as the field artillery (howitzers) "brigades are rearmed with the modern howitzer—firing a 35 lb. "shell—which is now under trial, the heavy howitzer will become "superfluous for anything but siege operations."

This is undoubtedly a view held by some people, and among them, General Langlois, who, not many months ago, wrote strongly against the introduction of mobile heavy howitzers into the field armies of France. He urged as his opinion, that the heavy artillery is altogether superfluous now except for siege work, and recommended that the money, which it was proposed to spend on the heavy artillery, should be devoted instead to increasing the field artillery.

But the view is an erroneous one, for the circumstances are quite different. In the one case, heavy guns were adopted because long range fire was an essential characteristic of heavy artillery, so long as the field guns could not do their own work at long ranges; and the necessity for them has now ceased to exist, because the new Q.F. field guns are capable of more effective fire at long ranges than the heavy guns. In the other case, the chief characteristic needed for the work which heavy howitzers are required to perform, is great shell power, and the necessity for these powerful weapons will increase rather than diminish, with the rearmament of the field artillery (howitzer) brigades.

For, as has been shown above, the fire of Q.F. guns compels an extensive use of cover, which, in its turn, necessitates a greater use of howitzer fire. Up to a certain point field howitzers will be sufficiently powerful and more suitable than the heavier weapons; but the employment of field howitzers reacts in its turn and necessitates the use of strong head cover. This leads to a general improvement in the construction of field fortifications, and so increases the value of the fire of heavy howitzers. For two 35 lb. shell will not have as much effect on strong fortifications as one 70 lb. projectile, and under some circumstances they would be quite ineffective where the more powerful projectile would be productive of great results.

In an article on heavy artillery which appeared in the December number of the "Jahrbücher," General von Rohne, who represents a sound school of military thought, strongly advocated equipping the German heavy artillery with howitzers which fire a shell of 25 kgs. (=55 lbs.), and went so far as to say that when the heavy batteries

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are thus armed, there will be no need for field artillery howitzers. But this is going to the other extreme, and I doubt if many will be found to agree with him to that extent. The necessity for close support of the infantry by artillery fire was amply proved during the Russo-Japanese War, and this support can only be effectually afforded by mobile field howitzers, which, whether in the form of wheeled or pack artillery, will be required to accompany the infantry to within decisive artillery range.

Notwithstanding the opposite and extreme views held by two such eminent authorities on artillery matters as Generals Langlois and von Rohne, there is little doubt that heavy, as well as field howitzers, will be extensively employed in field operations of the future.

A study of the Russo-Japanese War leads one to the same conclusion. It is not possible to read an account of the operations in Manchuria without being struck with the fact that the want of a sufficiency of heavy and field howitzers was seriously felt by both combatants throughout the latter part of the war.

The failure of the Russian armies to hold their positions against the attack of the Japanese troops, even when the Russian artillery established its superiority over that of the Japanese army, must be largely attributed to the want of high angle fire equipments. For after the Russians had learnt how to handle their quick firing artillery properly, the Japanese rarely afforded them any opportunity for making use of the great advantage which the possession of Q.F. guns gave them.

Quickly appreciating the danger of offering the Russian Q.F. guns a vulnerable target to shoot at, the Japanese, thereafter, made extensive use of cover when advancing to the attack of a position, and in the later campaigns, were even wont to construct strong entrenchments by night, at each stage of the attack. As the Russians were ill provided with high angle fire weapons, they had not sufficient means of reaching the Japanese troops behind cover, and so were unable to effectively check the advance of the attacking infantry, which, by a skilful use of cover, generally managed to work their way to within assaulting distance without heavy losses.

The Japanese armies also suffered heavily from the want of high angle fire equipments. Had they been sufficiently provided with howitzers, it would not have been constantly necessary for the Japanese infantry to assault positions held by unshaken troops; for the Japanese artillery could then have bombarded the point of attack with howitzer fire, and might so, have shaken the morale of the Russian troops, prior to launching their infantry to the assault. They could also have maintained this fire upon the enemy's position up to a late moment in the assault, and might so have prevented the Russian infantry from bringing effective rifle fire to bear on the attacking troops.

As it was, the fire of the Japanese field and heavy guns produced little effect upon the Russian troops in their entrenchments even with high explosive or common shell, and the low trajectory fire of

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these guns could not be maintained over the heads of their own infantry during the final assault. Consequently the Japanese troops were forced to make their assault without the close and effective support of artillery; and the terrible losses which they suffered in doing so, are a testimony to the necessity for an attacking force to be supplied with a sufficient number of field and heavy howitzers.

Thus the evidence of the Russo-Japanese War demonstrates the disabilities which armies suffer from when insufficiently supplied with high angle fire weapons, and though but few instances of the effective use of heavy howitzers are to be found in the history of the war, and the battle of Mukden alone furnishes much proof of the value of these heavy weapons in field operations, yet there is no doubt that more would have been heard of their employment had a greater number been available.

Towards the end of the war, both armies recognised the necessity for having, as auxiliary to the field guns, weapons which combined the characteristics of high angle fire and great shell power, and as a consequence, every available howitzer was brought up to the scene of operations and took part in the final campaign.

In the case of the Japanese, this is noteworthy, in view of the argument, that field howitzers are all that are wanted now. For the success which attended the employment of the 4·7″ field howitzers at the battle of the Yalu, must naturally have increased the confidence of the Japanese in the sufficient power of these howitzer equipments, and the fact that they experienced the want of heavier howitzers later, may, I think, be taken as a proof that the shell power of the field howitzers was found to be insufficient against the formidable Russian entrenchments, which the Japanese infantry had to attack in the latter part of the war.

Before the battle of Mukden, the Japanese even went to the extent of bringing up some 28 c.m. howitzers from Port Arthur where they had done such excellent service, but the effect of these huge weapons on that later occasion was very disappointing, and the Japanese proved by their experience what has been generally accepted as an axiom hitherto, that in field operations, other than the siege of a fortress, there is a point beyond which additional gun power means energy wasted.

The evidence of the war further shows, that the heavy guns had little effect beyond the moral one produced by their long ranging powers, which were useful to the Japanese in particular, as they had no long range Q.F. field guns except the few captured from the Russians; and it is fair to conclude that with the introduction of quick firing field guns, heavy guns have become superfluous, and that normally, under existing conditions, the most suitable equipment for heavy artillery is a heavy howitzer of the most modern type.

That this is the conclusion generally drawn from the lessons of the war in Manchuria is, I think, shown by the action, which has been, or is now being, taken in this matter of armament of heavy artillery by all the principal military powers. To mention a few of the principal cases.

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France:—

In spite of the opposition of General Langlois whose extreme views have been mentioned above, the authorities in France have determined upon howitzers as the equipment for their heavy artillery, and some of their heavy batteries have already been armed with the new 15·5 c.m. (Rimailho) howitzer, which fires an 88lb. and 95lb. shell. It is said that they intend to replace all their existing heavy equipments (guns and howitzers) by this weapon, as soon as possible.

So much importance do the French attach to their heavy batteries possessing considerable mobility, that the Rimailho equipment has been constructed to admit of the howitzer being carried on a special carriage separate from the mounting, and in this way the weight of each part behind a team of six horses is kept as low as 48 cwt. But a mobility nearly equal to that of the field artillery is not necessary for heavy artillery, and an arrangement which necessitates a large increase in the number of vehicles, horses, and men, is obviously disadvantageous, where no compensating advantage is to be gained.

Germany:—

The writings of General von Rohne, Hoenig, and others, show that the Germans must be credited with having foreseen the future importance of field fortification and necessity for mobile heavy howitzers more than twenty years ago. In 1890, they equipped some of their batteries of heavy artillery (corresponding to our siege train) with Krupp 15 c.m. howitzers. This equipment which fires an 88 lb. shell and is effective up to a range of 6,500 yards, weighs only 59 cwt. behind the team and has recently been adopted as the heavy field howitzer of the field army. It has been replaced in the heavy artillery by a heavier siege howitzer.

Austria:—

The Austrian mobile heavy artillery is equipped with a 15 c.m. howitzer which fires an 81 lb. shell, and is effective up to 7,000 yards.

Russia:—

The Russian heavy artillery is at present armed with a 15·2 c.m. howitzer, which fires a 60-65 lb. shell and is effective up to a range of 3,700 yards only. The poor results which the Russian artillery obtained with these howitzers in Manchuria may be attributed more perhaps to defective ammunition than to limited ranging powers. But the latter defect is the more serious one, and though the Russians appear satisfied with their heavy artillery equipment, and nothing is so far known of any contemplated change, yet it is probable that they will take an early opportunity of replacing this out of date weapon by a modern and more powerful howitzer.

Japan:—

Previous to the war in Manchuria the Japanese had made no provision for heavy howitzers, and apparently did not contemplate the probability of having to employ these weapons in field operations. It was only due to the fortunate capture of some Russian 15·2 c.m.

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howitzers at the battle of Nanshan, that they had any heavy howitzers to employ in the later operations. Since the war, the Japanese have determined to arm their heavy artillery with 15 c.m. howitzers, which fire a 79 lb. shell and have an effective range of 6,500 yards. The weight of this equipment behind the team is 49 cwt.

Having then arrived at the conclusion that our heavy batteries should be equipped with a howitzer capable of great fire effect up to 7,500 yards, and shown that the chief military powers are moving in this matter upon similar lines, it becomes necessary to determine what weight of projectile is desirable for our howitzer. This is a question which must be considered in conjunction with the total weight of the equipment; for it is essential that this should be sufficiently mobile for heavy artillery purposes.

Mobility is a characteristic of heavy artillery which requires more consideration than it has hitherto received in this country. No doubt it is possible to go too far, as has been done in France, where they have aimed at obtaining for their heavy artillery a mobility nearly equal to that of their field artillery, notwithstanding the disadvantages inherent in the arrangement which they have adopted. But we have erred on the other side with the latest heavy artillery equipment in limiting the mobility of our heavy batteries to too great an extent by placing an excessive weight behind the team, and though the manner in which our heavy batteries got about at the manœuvres last year occasioned some surprise, yet it is doubtful if these batteries, heavily handicapped as they are, would remain mobile for long under the severe strain of a campaign.

Heavy artillery equipments should be sufficiently mobile to allow of batteries moving several miles at a trot in case of emergency. For the place of heavy artillery on the line of march will generally be behind all combatant troops, which are likely to be more urgently required, and it may be some miles distant from the scene of fighting when the need for heavy howitzers arises. It would then be a great disadvantage if the heavy batteries could not move forward at any faster rate than a walk.

It should be the rule, too, for heavy batteries to move into position at a trot with their detachments mounted on the vehicles; this is not provided for in our text books of training as it should be. The Germans recognise the necessity for it, and orders to this effect are laid down in their regulations for the tactical employment of the heavy field howitzers.

In the matter of mobility too, howitzers are more suitable as heavy artillery weapons than guns; for it is possible to manufacture an howitzer equipment of much less weight than a gun equipment, which fires an equally heavy shell, and so greater mobility can be obtained without any sacrifice of shell power. For instance, the weight of the present equipment 5″ B.L. (60 Pr.) gun reaches the prohibitive amount of 108 cwt. behind the team, whereas it would be possible to manufacture a 70 Pr. howitzer equipment of the most modern type within a weight not exceeding 72 cwt. behind the team,

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or even lighter if we are prepared to adopt the continental method of carrying no ammunition in the gun limber. This, with a team of eight horses, gives an average of 9 cwt. a horse, which would admit of the equipments being moved at a trot for several miles in emergency.

Therefore, if we adopt a heavy howitzer as the armament of our heavy artillery, we shall not only obtain the equipment best suited to the special rôle of heavy artillery under the new conditions of warfare, but also one more powerful and more mobile than the existing 5″ B.L. (60 Pr.) gun.

Tactical employment:—

The following principles should govern the tactical employment of a heavy artillery so equipped.

The heavy artillery is a reserve of power behind the field artillery, and will only be employed in the attack, when the fire effect of the Q.F. guns and howitzers is insufficient to enable the infantry to overcome the resistance of the enemy; as for instance, when the enemy is encountered strongly posted in a fortified position.

The chief duty, then, of the heavy artillery will be to prepare the way for the infantry attack upon this strong position, and the fire of the heavy howitzers will be especially employed against buildings, villages, the interior of high woods, strong field fortifications and redoubts.

Before, however, the preparation for the infantry attack is carried out, it is necessary to weaken the power of the hostile artillery as far as possible, and the heavy artillery should, therefore, co-operate when necessary with the field batteries in the artillery duel. By attacking the shielded equipments of the enemy with its powerful high angle fire, the heavy howitzers will afford real support to the field artillery.

In the final stages of the attack, the heavy artillery may, on occasion, be employed in support of the infantry to fire upon the enemy's infantry position up to the latest possible moment of the assault; but where, as should generally be the case, this support of the infantry is sufficiently provided for by the fire of the field howitzers, the fire of the heavy howitzers will be best employed against the enemy's supports or in searching the ground immediately in rear of the enemy's line of defence, so as to prevent reinforcements reaching the part of the position upon which the assault is directed.

The part that heavy artillery must play as an auxiliary of field artillery in the attack, is well summed up in the German regulations for the foot artillery, as follows:—"An intelligent distribution of the "tasks of the field and heavy artillery, the working together of both "arms in the artillery fight, and the probable crushing combination "of their effect against the place of assault are of the greatest im-"portance."

In defence, the heavy artillery will co-operate with the field guns in the attack upon hostile artillery, and it will also be employed against the strong field fortifications, which are likely to be extensively used by the attacking troops in future, or to search high woods and

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concealed positions which the enemy make use of in their advance. In the final stages of the attack, the fire of the heavy howitzers should as a rule, be directed against the enemy's artillery, so as to set free as many of the Q.F. guns as possible from this task and allow them to concentrate their fire upon the assaulting troops.

As in the attack, so in the defence, an intelligent distribution of the tasks of the field and heavy artillery and perfect co-operation between the two is the thing to be aimed at.

The heavy artillery may also be required to co-operate with the siege artillery in the attack upon permanent, or semi-permanent fortifications. In such operations the heavy artillery can be most advantageously employed against the personnel in the enemy's defences, while the heavier and less mobile siege equipments are engaged in the destruction of the permanent works or against docks, vessels in defended harbours, &c. For it is possible to push the mobile heavy howitzers forward by night, to positions prepared beforehand under cover at effective ranges, where they can utilize their high angle fire with possibly telling effect against the troops occupying the enemy's defences.

Supply of ammunition:—

As the heavy howitzers will sometimes be used against personnel and sometimes against material, the ammunition supply should consist of 50% of shrapnel and 50% of lyddite shell, and a sufficient quantity of each nature of shell must be carried with the batteries to satisfy requirements, until a fresh supply can be obtained from the divisional ammunition column.

The advantage of mechanical transport for the conveyance of ammunition becomes accentuated when one has to deal with such heavy projectiles as those of the mobile heavy howitzers, for a G.S. wagon drawn by horses will not carry more than about thirty-five 70 Pr. shell, whereas it would be possible to transport about 150 of these shell in a motor G.S. wagon with trailer. It is not practicable to increase the number of horsed vehicles with the field army to any great extent, and it would, therefore, seem advisable to allot one G.S. horsed wagon per howitzer to each battery and supplement this supply with a brigade reserve of two motor G.S. wagons per battery. There would then be 35 rounds per howitzer with the battery and 75 rounds per howitzer with the brigade reserve, making a total of 120 rounds per howitzer with the brigade, which should prove sufficient to tide over the time till the supply can be replenished from the divisional ammunition column.

Distribution:—

Great stress has been laid of late, on the advantage of making all artillery divisional, but while there are the very best reasons for making field artillery an integral part of army divisions, the principle cannot be applied with advantage to the heavy artillery. There would be no objection to making this divisional, as well as the field artillery, if it were possible to allot a brigade of heavy artillery to each division, but the disadvantages of encumbering an army with more artillery

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than it really needs, far outweigh any advantage that would be gained from the point of view of organization, and it is, therefore, not expedient to have more artillery with the field army than will suffice to afford the field artillery the necessary increase of power in emergency.

A brigade of heavy artillery to each army of two or three divisions is sufficient for this purpose and in order that this potential factor may be applied to the best advantage, it is better that the brigade should be kept intact as a reserve in the hands of the army commander, to be used by him when and where occasion demands, than that it should be distributed by batteries among divisions—a change which it is understood is unfortunately impending in our field army.

With long range field guns and powerful field howitzers, there is no longer any necessity for extensive dispersal of heavy artillery, and the disadvantages of unnecessarily encumbering the line of march of divisions with artillery which they will not ordinarily require, the necessity for concentrating the fire of the heavy artillery for a special purpose when it is employed, and the advantage of unity of command in carrying out this concentration are all strong arguments in favour of the heavy artillery being retained in the corps artillery, as at present.

The distribution of the heavy artillery, which is said to be impending, is perhaps of less consequence while our heavy batteries are armed with their present gun equipment; for it is ill suited to the proper rôle of heavy artillery under the new conditions of warfare, and is in reality only a reinforcement of power for the field artillery in carrying out their long range work. But when the heavy artillery is armed with a modern heavy howitzer and capable of fulfilling the special purpose for which it is now required, viz: that of preparing the way for the infantry attack upon fortified positions, it will be essential for the proper execution of this work that the batteries be brigaded together once more in the corps artillery.

In concluding the consideration of the subject in so far as it relates to mobile heavy artillery, it is to be hoped that the replacement of the new gun equipments of the heavy artillery at home by modern heavy howitzers will not be delayed, till we learn the need of them in the stern school of war, as did both combatants in Manchuria. We have not, unfortunately, an unlimited number of trained soldiers, and it behoves the government, therefore, to adopt as soon as possible, a change in war material, which will not only increase the fighting efficiency of our field army, but also help us in war time to husband our resources in men.

In India, the rearmament of the heavy artillery has not yet been carried out, and some of the batteries are still armed with medium guns, which fire shell of only 25 or 30 lbs. weight, while others are equipped with the old pattern 5″ B.L. guns on makeshift carriages. The former are quite useless now alongside the new field guns, and the latter are altogether unsuited to modern requirements. So it is essential that the heavy artillery should be rearmed without delay but it is to be hoped that the authorities in India will pause and reconsider the question before they adopt the 5″ B.L. (60 Pr.) gun.

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Apart from its unsuitability for the work of heavy artillery under tne new conditions, this equipment would be utterly unserviceable for employment across the Indian frontier on account of its excessive weight, which would soon reduce the heavy batteries to a state of immobility.

Anyone who has seen the 5″ B.L. (60 Pr.) gun working at home, and knows the nature of the country and condition of the roads across the frontier of India, must be impressed with the unsuitability of the equipment for the heavy batteries of the Indian Army.

It is a splendid opportunity to profit by recent experience, and the authorities in India will be well advised if they determine upon a modern heavy howitzer as the new equipment of their mobile heavy artillery. The army in India may one day be compelled to fight against tremendous odds and without any immediate hope of reinforcements from home, and the value then, of a weapon which adds to the fighting efficiency of the army, and tends to reduce wastage among the personnel will be appreciated at its full worth.

So long as the heavy artillery at home and in India is armed with the existing gun equipments, it is not likely to play either an active or useful part in the field operations of the future, for the more the powers of the new Q.F. field guns become appreciated, the less will the need of heavy guns be felt on the battlefield, and not until it is rearmed with mobile heavy howitzers can the heavy artillery hope to take an active and important share in the fighting, and so regain its position as an indispensable part of the field army.

Siege artillery:—

Finally the question of siege artillery must be dealt with, for "operations in the field and against fortresses cannot now be looked "upon as separate phases of war in point of time without disadvan-"tage." (Von Scherff), and in any war between civilised nations, the field army must be provided with adequate means of conducting fortress warfare when it takes the field. A very few days delay will often alter the whole state of affairs in war, and if a properly equipped siege train is not available when the attack of a fortress becomes necessary, opportunities of taking the fortress at a disadvantage may be lost.

The siege train is essentially a reserve of artillery which is only used in exceptional circumstances, and it should be directly under the orders of the Commander-in-Chief of the army in the field. As a general rule the siege artillery will follow behind the field army as part of the army train, until such time as an attack upon a fortress is imminent, when it will be moved to the scene of operations and placed temporarily under the orders of the officer conducting the siege.

The mobile heavy equipments of the field army co-operate with the siege artillery in the attack upon fortresses and are capable of affording great assistance, but they are not sufficiently powerful to produce much effect upon strong permanent fortifications, and it is, therefore, necessary to have in the siege train weapons of much greater shell power.

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In some foreign armies heavy guns still form part of the equipment of the siege train, but as high angle fire is more effective than direct fire against permanent fortifications, these are gradually being replaced by howitzers or mortars, and it is generally recognised now, that it is an advantage to equip the siege artillery with the most powerful high angle fire weapons that can be conveniently taken into the field.

Recent events have shown this, for at the siege of Port Arthur the Japanese used 28 c.m. howitzers, and the enormous effect which these huge weapons produced, not only upon land defences, but upon the warships in the harbour, was largely instrumental in bringing about the surrender of the fortress. The 28 c.m. howitzers fire a 500 lb. shell, which has sufficient capacity to contain a very powerful bursting charge, and as the effect of high explosive shells, which are the only useful projectiles for siege work, depends chiefly upon the size of the bursting charge, we see what an advantage the Japanese possessed in having howitzers of such large calibre.

It would be unwise for us to shut our eyes to the fact that the 6″ B.L. howitzer, which forms part of the equipment of our siege artillery, has not sufficient shell power for the fortress warfare of the present day. This howitzer, which fires a 100 lb. shell and is effective up to 6,500 yards, would be capable of producing very little more effect than the mobile howitzers of the heavy artillery, and has not a sufficient range for modern siege operations. The other equipment of our siege artillery, the 9·45″ B.L. howitzer, is a powerful weapon, which fires a 280 lb. shell and is effective up to a range of 7,500 yards, but it will be an advantage in future to have equipments of even greater shell power with our siege train, and it is satisfactory to know that a new siege howitzer is being designed which will throw a shell of 350 lb. containing a bursting charge equal to that of the 500 lb. shell of the Japanese 28 c.m. howitzers.

It is to be hoped that these powerful howitzers will in time replace both the existing siege artillery weapons, and be the only artillery equipment in our siege train. For though the 9·45″ B.L. howitzer is a powerful, and in many respects a suitable weapon for siege operations, the equipment which is separable into two parts for purposes of transport, is far heavier than it need be, and so causes a waste of energy. The two parts of the equipment, one for mounting, and the other the howitzer on a special travelling carriage, weigh 93 cwt. and 98 cwt. respectively, which weights are very excessive when compared with those of the German 8·3″ mortar. This equipment is similarly transported in two parts, which weigh respectively 51 cwt. and 79 cwt., and as this mortar throws a 260 lb. shell to a range of 8,600 yards, it is evident that the extra weight of our equipment gives us no corresponding increase of power.

It may, therefore, be hoped that with the new siege equipments, we shall get a considerable gain of power without much increase of weight over that of the two parts of the 9·45″ B.L. howitzer; and as long as the weight of either part does not exceed 5 tons, it is not excessive for siege artillery, which will always move at a slow pace.

With a siege train consisting entirely of modern siege howitzers

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which fire a 350 lb. shell, and a mobile heavy artillery armed with howitzer firing 70 lb. shells, our field army at home would be well equipped for the attack of fortresses; and remote though the possibilities of our fighting in Europe may appear, it is of the utmost importance that our preparations for war should be made in view of such an eventuality.

In India the case is somewhat different, for there is little likelihood of the army being required to attack a modern fortress, and the equipment of the existing siege train consists of 6″ B.L. howitzers only, which have hitherto been considered sufficiently powerful for any siege work that the army may be called upon to undertake. There will not be much necessity for this siege train when the heavy artillery in India is equipped with a mobile heavy howitzer, and it is probable that the existing siege companies will in that case, be converted into heavy batteries and added to the heavy artillery of the field army, an accession of power which would be of great value in the event of extensive field operations beyond the frontier.

Conclusion:—

In conclusion, I would add that I have, purposely, not touched upon the subject of hand mortars and similar weapons of greater calibre than our field equipments, for though these found a useful place in the Japanese field army in Manchuria, this was due to the fact that the Japanese were ill equipped with modern artillery material, and I am of opinion, that in the future, an army which is properly supplied with Q.F. field guns, heavy and Q.F. field howitzers, and a well equipped siege train, will find no use for such weapons.

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"DUNCAN" COMMENDED ESSAY, 1907.*

"To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations, and what rules should govern their tactical employment?"

By CAPTAIN O. L. PRICE, R.G.A.

"SPES TUTISSIMA CŒLIS."

THE units of artillery operating with a field army in modern warfare may be divided into four classes, viz:—

(1). Horse and Field Artillery.
(2). Mountain Artillery.
(3). Siege Artillery.
(4). Heavy Artillery.

But the subject of this essay concerns only the two latter:—Siege and Heavy Artillery.

The rapid strides that have taken place during the last few years in the development of artillery, the introduction of quick-firing guns, use of smokeless powder, the increased range and penetration of the magazine rifle, enhancing its power of both offensive and defensive action, have convinced us that heavy guns and howitzers will take a very important, if not leading part, in field operations of the future, between armies of civilised powers.

The lessons afforded by the recent campaigns in South Africa and Manchuria have been interesting and instructive, and have shewn us that though the use of heavy artillery as a mobile unit in war is at present but imperfectly understood, nevertheless it is a most valuable accessory to field artillery, and one which, when properly organised and controlled, will form an indespensable and powerful factor in deciding battles in our future wars.

Under normal conditions, the respective rôle and duties of heavy and siege artillery are distinct and separate in themselves, but occasions may arise in future campaigns—as they have done before now—when co-operation between these two branches of artillery may be necessary and advantageous. For examples, we have only to go back as far as the battles of Nanshan and Liao Yang in the Russo-Japanese War. In the former engagement the Russians not only brought up siege pieces from Port Arthur to strengthen their position, but left them as spoils of the battle in the Japanese

* The three Commended Essays were not placed in order of merit by the Judges nor are they published in any particular order save as expediency suggests—Secretary, R.A.I.

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hands, owing to their lack of mobility and the hastiness of the retreat. At Liao Yang the Japanese employed heavy guns and howitzers near the railway to bombard the semi-permanent Russian earthworks. But before proceeding further with this subject, it would be as well to consider *what natures of field works* our heavy artillery may be called upon to engage in war.

They may be grouped into three classes, viz:—

(1). Hastily constructed fire and shelter trenches, gun pits and epaulments. Buildings and villages temporarily strengthened.

(2). Semi-permanent works in the field.

(3). A modern fortress.

Of these (1) will be met with on every battlefield—cover thrown up on the eve of an engagement or while it is in actual progress.

No. (2) will consist of works planned and laid out by the Engineers, either on the outbreak of hostilities or in anticipation of an attack, to cover important strategical points and to fortify positions naturally strong.

No. (3) will consist of works constructed in peace time probably surrounding a city, arsenal, or naval base, to the possession of which extreme importance is attached.

Of these three classes we may consider (1) and (2) as allotted to the natural rôle of heavy artillery, and (3) to siege artillery.

In "Siege Artillery Drill, 1900," page 109, we find the following passage:—"The future siege will, in fact, differ but little from the "defence and attack of any position, except that probably more "time will be spent over it," from which we may assume that siege artillery will, in future, play an important part in the attack of a position, when the resistance met with is so obstinate and protracted as to allow time for a siege train to be brought on the field; and that heavy artillery will be used in any extensive operation to bridge, so to speak, the gap which exists between field and siege artillery, and to take upon itself the duties of either, so far as lies in its power. But in order to discuss the tactical employment of siege and heavy artillery in the field, it is necessary to treat them separately.

A. SIEGE ARTILLERY.

Organization:—

It would seem that the probability of the British Army ever being required to undertake siege operations on a large scale has been completely overlooked or disregarded by our military authorities.

The nucleus of our siege train consists of three companies, Royal Garrison Artillery, on the home establishment and three companies in India; the former equipped with 6·6-inch R.M.L., 5-inch B.L., 6-inch B.L. of 30 cwts., and 9·45-inch B.L.; and the latter with 6·3-inch and 8-inch R.M.L. and 6-inch B.L. howitzers. In addition, there are a few volunteer companies trained in the drill of siege guns.

Allowing that each siege company will man 8 guns on service

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the present home establishment would form one siege train division equipped with 24 howitzers. Can this be considered sufficient to accompany a "Striking Force" of 150,000 men?

Of course it can be urged that siege trains will be formed in the event of war, from garrison companies taken from the coast defences. But even if these units can be spared—allowing that England retains command of the sea—and their places taken by militia and volunteers, it must be remembered that siege artillery work is most scientific and requires highly trained specialists.

In the face of experience gained from the Russo-Japanese War, we must be prepared to embark siege guns at the commencement of hostilities with any civilised power, not merely to be present if siege operations are likely to take place, but to accompany the advance of the field army. For both the Russians and Japanese brought siege artillery on the field of battle every time that circumstances permitted of it.

It is essential that siege trains of the future shall be equipped with both heavy guns and howitzers capable at long ranges of using direct and high-angle fire in the attack of personnel and semi-permanent works with shrapnel and high-explosive shells.

To this end, the equipment might consist of 6-inch B.L. guns, heavy howitzers of 8-inch or 9-inch calibre, and light howitzers of 6-inch calibre. Although the Japanese at Mukden used 11-inch howitzers, the difficulties of transport were so great that their use must be regarded as abnormal.

Considerations affecting its employment:—

The size and shell power of heavy guns and howitzers are limited by the following considerations:—

(1). Difficulties of transport.
(2). Regular service of ammunition.
(3). The time required to lay platforms and mount the guns for action.

As regards transport, the advance of a field army will always follow a railway, waterway or roadway when possible, and heavy guns will follow it moved on trucks, barges, &c., or if on a road, mounted on carts or travelling carriages, drawn by horses or motor power.

Mobility:—

The power of siege artillery should not be sacrificed more than is actually necessary to mobility. It is required to reach the field army when the engagement has developed, and the most advanced line of the enemy's position has been carried. Then a superiority of fire must be established to enable the infantry to continue its advance.

The battles of the future will, in all probability, be proceeded by a few days lull in the operations, to allow the attack to reconnoitre, close up, deploy its columns and collect stores and ammunition, before launching its troops into the battle. And, as the engagements of

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the future will probably continue for as many days as they formerly did hours, siege trains should have ample time to reach the field of battle when required, provided they follow close on the heels of the army as it advances.

In "Siege Artillery Drill," Section VI., organization still remains unwritten, and though it is improbable that siege artillery will form an integral part of corps or divisional artillery, nevertheless the organization should be definitely decided and siege train divisions held ready to proceed with an army on mobilization, as occasion requires.

Positions and employment in action:—

The typical modern position may be described as an important strategical point, covered on one or more sides by artificial works. The position chosen will be, when possible, of natural strength forming a series of lines of defence. The outpost lines may be advanced some distance in front of the main defence and will be strongly held by artillery and infantry entrenched.

The main position will consist of lines of semi-permanent field works, gun epaulments and batteries supplemented by shelter trenches, fortified villages and woods strengthened by obstacles, mines, and entanglements.

The siege and heavy guns of the defence will be in position in concealed batteries, and the field and horse artillery pushed forward as far as possible and using indirect fire. In the attack of such a position the employment of siege artillery will be governed by several considerations.

(1). Choice of front to be attacked.
(2). Selection of positions for batteries.
(3). The best line of communication to the base.
(4). Number of batteries available for the attack.
(5). Tactical considerations.

Of these (3) is by far the most important and the other conditions must be regulated by it. Ground for the position of batteries should be chosen with a view to the attacking guns being able to concentrate the most effective fire on the place selected for the final assault. Guns should be concealed whenever it is possible, and at such a distance from the position, that they are able to reach the heavy guns of the defence and throw shell well into the position. Expense magazines should be close to the batteries and filled with a supply of ammunition for 24 hours' firing, which can be quickly replenished from the field arsenal.

If the positions have been chosen with care and forethought, there should be no need to alter them in later phases of the attack. Siege artillery can fire effectively up to ranges of 10,000 yards, and though it is not advisable to have recourse to extreme limits, owing to the difficulty attending the observation of fire, yet the range and accuracy of modern guns allow bombardment to be carried out most effectively at from 4,000 to 8,000 yards, and at these distances field guns are unable to make any effective reply.

Since guns should always be placed in concealed positions and if this is not possible, the greatest importance should be attached to

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the invisibility of the works in which they are mounted. In all cases protection should be afforded for the detachments by the construction of shelters and splinter-proof traverses; for although no form of field work is capable of resisting common shell fired from howitzers, nevertheless the effects of bursts may be localised. Finally, in the construction and arming of batteries care should be taken that the enemy's attention is not attracted to the sites selected for them.

Special duties in action:—

Siege guns were employed by both the Russians and Japanese in the late war; but for different reasons, with the Russians they were not popular, partly perhaps, because their utility was not fully recognised or properly employed, and partly because their organization was incomplete. They were used to make good the lack of high explosive shells in the field artillery equipment. With the Japanese, on the other hand, they were considered so useful that no chance was lost of employing them whenever circumstances permitted it, for the following reasons, viz:—

(1). To attack the enemy's heavy artillery.
(2). To support the field artillery, which was inferior to that of the Russians in rapidity of fire and shell power.
(3). To bombard the semi-permanent works of the defence.
(4). To allow the field artillery to be withdrawn for the purpose of making flank attacks.

And although the Russians assert that the fire of heavy guns had no direct influence on the result of the engagements, it appears from the accounts of unbiassed critics that the effects produced by them, in many instances, were of great value to the Japanese.

The action of the artillery in the attack is divided into four phases:—

(1). To discover the positions of the opposing artillery.
(2). To establish a superiority of fire.
(3). To concentrate all available guns on the point chosen for the final assault and to support the infantry advance.
(4). To harass the enemy in retreat.

To carry this out successfully, each branch of this arm must devote itself to its own separate duties. Siege artillery being the most powerful in shell power, far-reaching in range, and capable of employing high-angle fire, must direct its attention and energy to destroying targets which the other natures of artillery cannot attack with any hope of success.

What applies to the attack applies equally to the defence, with one modification. Siege artillery in the defence should not disclose its position in the earlier stages of the fight. If once located, it may have to change its position, and an alternative position may not be easy to find. It should reserve its fire for the attack of heavy guns or when the field of the defence is being dominated and silenced.

Having briefly summarised the general action of artillery in the fight, let us turn to the consideration of those targets which it will

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be the special rôle of siege guns to engage, and the method by which they may be attacked.

(A). Troops under cover:—

The great majority of attacking troops, and probably all the troops of the defence, will be under cover either natural or artificial, during daylight. The trenches in which they are concealed, probably of low profile and sunk well beneath the surface of the ground, will give sufficient cover to men standing or kneeling and will be impervious to shrapnel from direct-fire guns. It has long been acknowledged that field artillery can do little damage against well-entrenched infantry with shrapnel and high explosive shells. As fire and shelter trenches are unlikely to be provided with overhead cover, the best means of attacking them will be with shrapnel from heavy howitzers, dropping at an angle of 35° and burst nearly directly above the trench. The use of high explosive or common shell from howitzers seems an expensive means of attack against this form of trench, and one which would be better employed against other kinds of targets. Siege guns and howitzers, owing to the long ranges at which they can fire, may have opportunities of directing an enfilade fire against trenches constructed on the flanks of a position; and in such cases the use of both shrapnel and high explosive shell will be most effective.

Field guns if not using indirect fire, will in all probability be placed in pits and epaulments where they may be expected to get a severe handling from the guns of any calibre if once located.

The Japanese in the late war resorted frequently to indirect fire, for they considered that if once a battery showed itself it would be placed out of action by the enemy's fire.

The adoption of shields for field guns may cause these tactics to be considerably modified. For critics on the continent consider that the shrapnel fire of field artillery will have no appreciable effect on shielded guns, and that they can only be attacked with high explosive shells.

Hence, in the future, heavy guns and howitzers may be called upon to engage field guns with both shrapnel and high explosive shell, if the latter trusting to the protection of their shields, use direct fire and come into action in the open.

(B). Field works and redoubts:—

Field works of a semi-permanent or permanent nature may be considered as the chief defences of the modern fortress and position. Fortifications, except where they are at present in existence, are not likely to be constructed in the future, for masses of stonework and concrete are very vulnerable to the effects of modern explosives. In a position, field works large and small, may be regarded as the points d'appui in the lines of defence, connecting infantry trenches and communications, and forming refuges for the troops not actually allotted to the firing line. Modern requirements lay down that the field redoubt shall be of low profile, and in its construction, invisibility is the principal factor. For this reason little will be gained if siege

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artillery applies itself to breaching operations; it is in every case better to destroy personnel than material. The parapets will present small targets and even if struck will suffer little damage, while the interior of the work and garrison may remain untouched.

Redoubts are usually constructed with overhead cover, traverses and shelters, and cannot be built sufficiently strong in the field to resist common shell from even field howitzers, though they are proof against shrapnel from all natures of guns. It seems that the co-operation of siege howitzers and field artillery will be most successful in attacking this kind of cover. The former firing common and high explosive shell, with direct or delay action fuzes, making the interior of the work untenable, while the latter use shrapnel against the defenders as they attempt to escape. High explosive may be considered very local in its action, but in an enclosed work its destructive powers would probably be very great.

Field redoubts may be regarded as important tactical points in the lines of defence, and as such, will be strongly garrisoned and difficult to assault. Hence it will be the first duty of the assailants to impair their fighting value when once a superiority of artillery fire has been gained. This can best be effected by high angle fire from field and heavy howitzers, as the attack of the low earthen slopes of the thickness employed in redoubts, by direct fire, is a waste of time and ammunition which might be more profitably employed against other natures of targets.

(C). Siege guns:—

It is the primary and most important duty of siege artillery to engage and overpower the heavy guns on the opposing side. It is for this object that its presence on the battlefield is justified, and no time or opportunity should be lost in accomplishing it, for while the heavy guns are in action, they must needs engage the time and attention of their adversaries.

When possible siege howitzers of the defence will always take up a position under cover, and usually so far to the rear as to be out of effective range of field artillery. The nature of the ground regulates to a certain extent the manner in which howitzers are to be attacked. In undulating and slightly accidental ground they will not be able to obtain much natural cover, and will probably betray their positions by the flashes of firing. In this case shrapnel from heavy guns at long ranges will have a steep enough angle of descent to search the ground on which they are placed. But in hilly country howitzers may conceal themselves so effectually, that it may be found impossible to locate them or observe fire effect. The extreme angles of elevation at which they can be fired allow them to be brought into action at the foot and on the reverse side of steep slopes where they are screened from view and the direct fire of any guns. In this case their positions can only be discovered by means of spies, captive balloons, or the presence of observers and range takers in their vicinity, and even when located they will be extremely difficult to silence. Only high angle fire can be employed under these conditions, and probably both shrapnel and high explosive would be used.

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The operation of silencing concealed batteries necessitates the expenditure of a large quantity of ammunition. The ground in which they are known to be in position should be systematically covered by fire, and for this purpose the use of shrapnel is more economical than that of common shell.

If any form of observation of fire can be employed, the task of silencing howitzer batteries is not so difficult; for being only able to change their positions slowly owing to their want of mobility, they may be disabled by direct hits or the detachments driven to seek cover. The observation of fire instruments in use with our siege artillery ensuring great accuracy at long ranges.

(D). Villages and woods:—

Although the Russians made scanty use of their siege artillery in the Manchurian Campaign when attached to the field army, and have but little to say in its favour, nevertheless they acknowledged that it was employed most effectively on several occasions to clear villages which had been seized by the Japanese and were being used as points d'appui in the infantry advance. A village, both in the attack and defence, may be regarded as a strong tactical point. The perimeter being placed in a state of defence, either by strengthening existing cover in the shape of walls, hedges, &c., or by throwing up trenches, will be manned by infantry, machine guns, and possibly field guns. Supports and reserves, supplies of ammunition in wagons and limbers, will be covered by existing buildings and secure from rifle and field gun fire. In the attack of such a target an intelligent co-operation of siege and field artillery will be most effective—howitzers dropping high explosive shells among the buildings, where they will cause great damage, while guns prevent the occupants of the villages getting away, by shrapnel fire.

(E). Reverse slopes of a position:—

It is to be expected that great damage will be produced by artillery in the zone lying in rear of the firing lines. This zone covered with wagons, ammunition columns and infantry in close formations, will form a large and vulnerable target on which artillery fire will inflict heavy losses and create coinsiderable moral effect. In this task field guns will be greatly assisted by the fire of heavy guns and howitzers.

On the reverse slopes of a position in rear of the firing lines, we may expect to find supports and reserves of infantry, the limbers and wagons of batteries in action, together with the gun teams, trusting to their invisibility to escape the effects of shell fire. High angle fire covering ground in which personnel and materiel are known to be hidden, should inflict serious losses, and may cause batteries to cease firing from want of ammunition, and prevent them being withdrawn owing to casualties in the gun teams.

When once the range to batteries has been found it is advantageous to employ progressive fire, to intervene a danger zone between guns and their ammunition supply, and in the hopes of inflicting losses on concealed targets. In this manner it has frequently occurred

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that more damage has been caused than by the employment of direct fire on the batteries in action.

B. HEAVY ARTILLERY.

Heavy artillery may be defined as "all artillery equipped with mobile guns of 4-inch calibre and upwards."

Its re-adoption into our army within recent years may be traced directly to the experience and lessons gained in the last South African Campaign, and the need of it in modern warfare has been fully confirmed by its frequent employment in the Russo-Japanese War.

To quote General de Negrier in his critique on the lessons of this war—"Artillery of heavy calibre is now indispensable to field armies; we must resign ourselves to this necessity." In the earliest stages of the war in South Africa, the deficiency of more powerful artillery than field artillery made itself painfully manifest. Our own shortcomings were to a great extent rectified more by good fortune than good management. The timely assistance of the Royal Navy saved us from a somewhat embarrasing situation, and allowed time for heavy guns and men to be hastily collected together without organization or cohesion, and to be despatched to the seat of operations.

So far we have profited by this lesson to the extent of equipping sufficient heavy artillery to accompany two army corps in the field; and presuming that this is enough for future occasions, it has still to be decided whether the guns, carriages, and transport of the batteries at present in existence are likely to fulfil modern requirements on active service.

We have at the present time twelve garrison companies of regulars—six in India and six at home—equipped with heavy guns, and called heavy batteries. In addition there are numerous volunteer corps of artillery trained in the drill and practice of heavy guns.

The heavy batteries on the home establishment are formed into two brigades, each of three batteries and one ammunition column—each brigade forming an integral part of the corps artillery of an army corps.

At war establishment, a heavy brigade is composed of 12 guns, 22 officers, 635 men and 530 horses, riding and draft. The distribution is as follows:—

Headquarters.....	Personnel 18, horses 13.
3 batteries.....	Personnel 483, horses 357.
Ammunition column...	Personnel 156, horses 160.

Each battery is made up of two sections, each of two guns, and the transport consists of four guns and limbers, eight G.S. ammunition wagons, three G.S. wagons for baggage, stores and supplies, and one water cart. The ammunition column carries its ammunition in eighteen G.S. wagons. The equipment of ammunition per gun is 250 rounds, lyddite and shrapnel, distributed as follows:— 100 rounds with the battery, 70 rounds with the ammunition column and 80 rounds in the corps ammunition park.

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Heavy batteries are at present equipped with the 4·7″ Q.F. gun of 42 cwts., firing a 46-lb. shell; but it is understood that it will be shortly replaced by a new 60-lb. gun which has already been issued to certain units for experimental purposes, and is undergoing trials. The present equipment is unsatisfactory in many respects. The gun is long and unweildy, and erratic in its shooting, even in coast defence batteries. The weights on gun and limber wheels are badly distributed. The recoil arrangements are inadequate, and on its present type of travelling carriage, the gun loses all claims to be called a quick firer. Finally, the wheel tyres are not broad enough to give a good bearing when travelling over soft ground. It is to be hoped these faults will be remedied in the new equipment.

The general rules governing the employment of horse and field artillery as set forth in "Field Artillery Training, 1906," apply equally to heavy artillery, but must be modified to a certain extent to allow for the advantages and disadvantages of this class of ordnance.

The special characteristic of heavy artillery is its great shell power combined with accuracy of fire at long ranges; but it is handicapped by limited mobility. Although it is capable of firing at ranges up to 10,000 yards with considerable effect, it is unlikely to be employed at extreme ranges owing to the difficulty attending correct observation of fire. Moreover, one of the advantages of its long-range fire is its power to cover as large an area as possible, in rear of the enemy's position, with shells. This advantage is minimised if guns are brought into action at too great a distance from their objective. On the other hand, owing to its limited mobility it is inadvisable, and often dangerous, to post heavy artillery in a position that is too advanced. Under these circumstances it will rarely come into action at ranges within 4,000 yards of the enemy's lines, and then only in exceptional cases. It will be the object of heavy artillery to place itself in such a position that it is out of range of field artillery shrapnel fire—its extreme limit being from 5,000 to 6,000 yards with the present equipments of foreign powers. The primary duty of heavy artillery is to engage targets which field artillery cannot hope to do with any chance of success, viz:—

(1). Heavy and field artillery at long ranges.
(2). Villages, localities and buildings.
(3). Batteries and trenches which can be enfiladed by long-range fire.
(4). The point chosen for the final assault where its great shell power should produce considerable effect.

Its secondary duty is to assist other natures of artillery, to co-operate with them in silencing the hostile batteries, and to support the advance of its own infantry.

The introduction of quick-firing guns into modern warfare has caused two points to be brought into important prominence, viz:—

(1). Necessity for cover.
(2). The difficulties attending change of position in action.

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It is now generally recognised that artillery cannot be expected to remain in action or carry out its duties unless it can obtain natural or artificial cover for its personnel. The rapidity and intensity of well directed gun fire is so great that detachments must be temporarily withdrawn if artillery fire is concentrated upon them, or suffer serious losses. And for this same reason the movement of batteries from one position to another may be almost impossible, unless they can be limbered up under cover, and moved forward concealed from the eyes of the enemy. It is probable that positions occupied in the early stages of the battle, or previous to the commencement of the action, may have to be utilized till the infantry attack is successful, or till darkness intervenes to hide the movements of one side from the other. It must be remembered that artillery is only effective when in action, and, therefore, changes of position mean loss of time, and consequently loss of effect. Thus frequent changes of position are to be deprecated except when actually necessary, and should then be carried out with as much rapidity as circumstances permit.

Modern improvements in guns have given us no definite rule regarding the advisability of employing batteries massed or dispersed in action. The great extent of front occupied by armies in modern warfare tends to the dispersion of guns to cover so wide a front. With heavy artillery the fighting unit may with advantage be a section of two guns. In the attack it will not be generally sound to split up a section owing to increased slowness in ranging, and the impossibility of providing single guns with officers for observing and controlling the fire—two being necessary with each gun. Though the dispersion of sections and batteries require excellent arrangements for communication, to enable fire effect to be concentrated where necessary, and to ensure success, still it possesses the possibility of dispersed guns being able to bring enfilade fire to bear more frequently on the enemy's position. This applies particularly to heavy artillery, with strong escorts, placed on the flanks of the attack and defence where it will, in addition be able to delay turning movements, and cause longer detours to be made by the assailants, thus gaining time which may be of great value to its own side.

With heavy artillery choice of targets and the intensity of fire to be employed against them, must be regulated to a certain extent, by the weight of ammunition and the difficulties attending its transport in the field. Reckless expenditure of ammunition is always to be avoided, and more particularly with this class of artillery, which only carries a limited supply. Both high explosive common and shrapnel, are carried in the limbers and wagons of the batteries, and their use will be governed by the nature of the target to be engaged. Trenches, field works, villages and buildings, will usually be attacked with common shell. The action of lyddite is local, but in confined spaces its effect is very violent. Rocky or frozen ground enhances the value of this explosive, while soft earth and sand smother its powers. Shrapnel is essentially a man-killing projectile and is of little value against matériel. It will be employed against batteries advancing into action, bodies of troops in dispersed or close formations, and infantry sheltered by a minimum of cover.

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Heavy artillery in the attack:—

The action of artillery in the early phases of an attack will depend to a great extent on the dispositions and conduct of the enemy. Should he be well entrenched in a strong position, he is not likely to reveal the positions of his batteries till the advance of the infantry compels him to do so, but if he is fighting a delaying action, to gain time is his chief object, and he will probably open fire at extreme ranges, to cause the deployment of the infantry, and to delay the advance of the attackers. Previous reconnaissance will have disclosed the extent of the enemy's position and the intentions with which it is being held, but it may not be till the battle has developed that the commander of the attack can decide which is to be the point where the final assault is to be pushed home. With him lies the advantage of the initiative, and his principle object will be to make his main attack come as a surprise to the defenders.

The deployment of heavy artillery will be always covered by the troops preceding it—both of the advanced guard and the main body. It may be required to come into action in the early stages of the engagement, out of range of field artillery fire, with a view to drawing the defender's fire, and thereby discovering his dispositions. It is unlikely that this ruse will be successful, except in the case of an enemy fighting a delaying action. But should the defenders open fire at this stage, it will be the duty of every class of artillery to come into action at once, and endeavour to silence the fire, to allow the attacking infantry to proceed without interference. If the defenders reserve their fire, it may be possible for a few batteries to push forward in company with the infantry and take up positions at close ranges. But the bulk of the artillery, including the heavy artillery, will select suitable supporting positions, unlimber under cover, and be prepared to open fire rapidly as targets present themselves. It will usually be unnecessary for the attacker to make use of all his artillery in the first stages of the attack. A few batteries well pushed forward will suffice to draw the defender's fire, and the remainder should remain in reserve till the situation develops.

The tendency to mass batteries in action appears to be on the wane. The improvements in modern armaments have proved it unnecessary, and it is not often possible to find suitable positions for numbers of batteries to come into action together in line. So long as they are able to concentrate their fire when required, dispersion should be encouraged. The dispersion of batteries and sections of heavy artillery in the attack is advantageous, for it detracts nothing from their powers of being able to concentrate fire if positions are well chosen. On the other hand, it enables them to be distributed equally along the whole front to be attacked; it perplexes the defenders as to the real point of assault; it affords them better opportunities of bringing enfilade fire to bear on distant parts of the position; and they are better placed to support flanking attacks, or repel those undertaken by the defenders. Heavy batteries will rarely come into line with field batteries, for owing to their long range fire and limited mobility, positions should be chosen some distance in rear of them from where they may be able to distract the defenders fire, enabling

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the field guns in the heat of the action to move forward to close ranges in support of the infantry attack. The choice of artillery positions is a most important point; for heavy artillery the chief requisites for a good position are, briefly, as follows:—

(1). Concealment for the guns in action; or failing this, cover while unlimbering.
(2). Good platforms for the guns.
(3). An extensive and clear field of fire.
(4). Facilities for ammunition supply.
(5). Cover for gun and wagon teams.
(6). Good observing stations in the vicinity.

It will often happen that positions can be sheltered beforehand, and guns may be moved into them under cover of darkness, ready to open fire at daybreak. When it is remembered that the same positions may have to be occupied for long periods at a time, and that the movement of heavy guns in action is inadvisable and often dangerous, it is evident that considerable care and forethought must be exercised in selecting them, to allow for unforeseen contingencies that may occur. The period that will usually elapse between the time of deploying for action and guns opening fire may be usefully employed in a thorough reconnaissance, a careful selection, and final preparation of the position for the efficient service of the guns, and the protection of their personnel.

The provision of cover is of vital importance. In undulating accidented country, natural cover may be easy to find, and the presence of guns concealed from the defender, both when advancing into, and when in action. But even if the position of guns cannot be hidden, it is necessary to dig shelter trenches for the detachments to retire to in the event of the whereabouts of the battery being discovered, and a concentrated and searching fire being directed upon it. Heavy batteries, though they may be out of range of the field guns of the defence, will probably be the objective for the heavy artillery, if there is any present.

The effect of indirect fire from concealed positions, though not so great as direct fire, must not be under rated. It may inflict considerable damage without their own position ever being located; thus affording complete immunity from fire.

The artillery duel as a separate and initial phase of an engagement is now hardly recognized as such. If the defender has taken up a position, and means to hold it, it is improbable that he will risk a preliminary duel with superior artillery, when the chances are that his guns will be silenced before their energies can be utilized to attack the advancing infantry. An attack to be successful necessitates the most intimate co-operation between all arms. Artillery must engage artillery to silence it and prevent it impeding the attacking infantry. The support thus given must be regular and systematic, and last from the early part of the engagement till the infantry's efforts have been crowned with success, or they have no further need of assistance. Heavy artillery must play its respective part in the general duties of this arm. The value of its long range and great

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shell power must be utilized to the full extent. It will be called upon to engage troops in close formations, batteries on the march and changing positions, lines of ammunition supply and supply wagons and all the impedimenta which accompanies an army in the field, scattered over the area lying in rear of the position to be assaulted. Villages, buildings and field works will be its special duty to destroy. In the final attack on the position, in co-operation with other natures of artillery, it must direct its fire on the point selected, using shrapnel till the advancing infantry are within a short distance. Then changing to high explosive shells it can continue to fire for some time after shrapnel fire would be dangerous to its own side, and finally by a slight increase of elevation it can search the reverse slopes of the position and prevent the advance of the supports and reserves of the defence.

Heavy artillery in the defence:—

The action of heavy artillery in the defence must be regulated to conform with the tactical requirements of its commander, and the considerations which have influenced the occupation of a position. Firstly, ground may be held by an army with a view to resisting an enemy at a spot where he is placed at a disadvantage if he wishes to attack. The position will have been chosen with due regard to strategical and tactical conditions, and strongly fortified to resist attempts at assault, so that an enemy having exhausted his strength in vain efforts to capture it, may be driven back and defeated by a vigourous counter attack. Secondly, a position may be occupied with a view to gaining time; in fact a delaying action to hinder and retard an enemy's advance, with the object of either allowing for the arrival of reinforcements, of covering a flank march, of acting as a rear guard to a retiring army, or of permitting the withdrawal of stores and ammunition from an arsenal or depôt.

When time is the dominating factor, heavy artillery will be called upon to utilize the extreme limits of its long range fire against the attackers as soon as they can be engaged. By so doing, it causes an early deployment; columns cannot advance on exposed roads; delay is caused by extending, and advancing slowly across the intervening ground in attack formations. The time thus gained may prove invaluable to the defenders, and even cause the intentions of the enemy to be frustrated. But if a position is strongly held, well entrenched, and chosen as the place for a trial of strength with an enemy, artillery may with advantage reserve its fire until the advancing infantry affords a vulnerable target at decisive ranges. It will be the object of the attackers to draw the fire of the defenders batteries in the early stages of the engagement, to locate their positions, and then concentrate on them in turn, and silence them. At this period, heavy artillery may be usefully employed in preventing the approach of the attacking batteries to decisive ranges in support of the infantry advance. No advantage will be gained by committing all the guns of the defence to a premature bombardment at the commencement of an engagement. A few will necessarily be pushed forward to the front of the position, and will suffice to keep the at-

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tackers at a distance, while the remainder, including heavy artillery, will be so dispersed as to bring a rapid and effective fire to bear on the main lines of advance when the action has developed.

When artillery positions in the front line of defence are inadequate, and only suffice for the requirements of the lighter armament, it may be necessary for heavy artillery to be placed on commanding ground in rear of the main position. This can be done without affecting the efficiency of fire, and will generally be advisable, especially in the event of a retirement being anticipated, when the heavy guns may need to be withdrawn in the heat of the action. The retirement of the artillery is always bad for the morale of the troops, but if placed in a position in rear of the firing lines, its movement will in all probability escape notice. The dispersion of heavy artillery into sections and even single guns along a position is advantageous. Posted on the flanks of the defence, they will be able to delay and harass turning movements, and the action of cavalry against the lines of retreat. They should be able to command all roads, defiles, and lines of advance by which an enemy may advance, and they should be capable of concentrating, and bringing enfilade fire to bear on the attacking infantry in the final assault.

Heavy artillery will but rarely be required to make decisive changes of position when once an action has commenced. If it is necessary for guns to be moved to a threatened point, or to support the movement of the counter-attack, horse and field artillery will be utilized, although heavy artillery may be required to run up into a position from which it can obtain a better field of fire, and afford support by the employment of direct fire. For this reason positions for heavy guns should be selected with a view to their using both direct and indirect fire when occasion necessitates it.

In the defence, concealment and cover for artillery are most important points. Although it may be impossible for the position of batteries to be always hidden when once they open fire, it is essential that pits or epaulments should be provided and shelter trenches constructed for the detachments, to which they may retire if the guns of the defence are smothered, and unable to remain in action. The defenders will probably have time before the engagement commences to place the position in a strong state of defence. Heavy artillery will usually occupy concealed positions and employ indirect fire, so that alternate gun pits should be constructed, and even alternate positions entrenched if circumstances permit. By so doing an enemy may often be deceived as to the strength of the artillery he is engaging, and batteries when located, and suffering losses from shell fire, may be able to move their positions and continue in action. Arrangements should be made for the rapid supply of ammunition; limbers and wagons may be entrenched near the guns, or supplies of ammunition brought up and stored with the battery. Ranges to all prominent objects should be taken and noted for future reference. If a retirement is anticipated, secondary positions should be selected for heavy artillery from which it can operate to cover the retreat of the infantry and artillery from the main position.

The passive defence of a position, except when the attacking

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force is very superior in numbers cannot be considered as normal. It will be the object of the commander of the defence to launch a counter attack, when conditions are most favourable to him, to bring the battle to a decisive issue. Artillery will not be kept in reserve for this purpose, as employed in this manner it may be regarded as so much power wasted. Though field artillery may accompany the force which delivers the counter attack it will be more usual to support its action by the fire of all available guns from the main position. If the batteries of the defence have been overpowered and silenced in the course of the engagement every effort must be made to re-open fire with them in the final assault of the hostile infantry, of to support the movement of a counter attack. This may necessitate heavy artillery leaving their concealed positions, to open direct fire on the batteries and infantry of the attack. No definite rules can be laid down for the allotment and selection of objectives in the final stage of the battle, but all natures of artillery must combine to repel the assault and prevent the occupation of any part of the position by the attackers.

Heavy artillery in the pursuit:—

When once an enemy has been compelled to retire, it is the object of the pursuers to harass his retreat and keep him on the move. Artillery must be boldly handled, and endeavour by every means in its power to beat down the resistance of the rear guard and create confusion and demoralisation on an already discomforted opponent. What heavy artillery loses by its lack of mobility, is compensated for, to some extent, by the power and effect of its fire at long ranges. It should be pushed forward as far as possible, compatible with safety, to take up positions on commanding ground from which it can obtain an extensive field of fire, and utilize its power to the best account. The special target will be the heavy artillery of the enemy which will be covering the retirement of its own force. Shrapnel fire directed against defiles, bridges, confined and narrow roadways crowded with troops and vehicles, will be very destructive, and cause great moral effect.

Heavy artillery in retreat:—

As mentioned before, when a retirement is anticipated, secondary positions for heavy artillery will be selected beforehand to enable it to cover the withdrawal of troops from the main line of resistance. In selecting these positions care should be taken that good lines of retirement from them exist. The limited mobility of heavy guns requires their withdrawal to be effected in good time, to avoid any possibility of capture. They will usually accompany the main body and retire with it, for unless the rear guard is exceptionally strong, or the enemy is incapable of an active pursuit, their safety may be endangered. The extreme limits of their long range fire may be effectively employed to prevent the advance of the pursuing batteries to positions from which they can bring a destructive fire to bear on the retiring force. The movements of detached bodies of horse artillery and cavalry making wide detours for the purpose of taking

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up positions commanding the line of retreat, may be checked by heavy guns placed in commanding positions.

Heavy artillery on the march:—

In "Combined Training, 1905," page 18, it is stated:—" If two " or more divisions are marching on one road the latter will generally " follow the leading brigade of the first divison." In this paragraph no light is thrown on the order of march of the Horse, Field and Heavy brigades of which the corps artillery is composed. It seems probable that they will move in the order of their mobility, and that the heavy brigade will bring up the rear, for the following reasons:—

In action, horse and field artillery will occupy more advanced positions, and will probably be required to open fire before heavy artillery. The movement of heavy guns is more likely to be retarded by heavy roads and bad weather, and if placed in the van of the corps artillery, would probably delay the advance of the column, and lead to the blocking of roads and confusion when deploying for action. In the case when the three divisions of an army corps can march on separate roads, the attachment of the corps artillery to any special column will be governed by tactical considerations, such as the proximity of the enemy, the condition of the roads, the route which affords the best artillery positions, and the point chosen for the main attack. Heavy artillery will only be employed with advance, flank and rear guards under special circumstances, and then only when the strength of these bodies is sufficient to ensure safety. One or more sections may be detached for these duties, and their position on the march will be in the centre of the column strongly escorted by infantry.

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The Training of Siege Artillery.

By CAPTAIN C. N. BUZZARD, R.G.A.

IN the May number of the "R.A. Journal," Colonel E. G. Nicolls, R.G.A., discussed the lessons to be learnt in the use of Siege Artillery from the operations at Port Arthur. There are many who regard the idea of our being engaged in similar operations as an absurdity, yet, strange to say, we are the very nation for whom the attack of a hostile port is possible, provided we have as an ally a nation with a considerable army. For before contemplating the capture of a coast fortress it is obviously imperative to obtain command of the sea, which we trust will be assured for us by the superiority of our navy. The importance of the capture of a large port in modern warfare can hardly be over estimated, and, if ever we be so unfortunate as to be involved in a great European war, it is far from improbable that we should find ourselves faced with such a task to assist our allies. With our large population we could scarcely decline to co-operate with our allies on land, on the grounds that we are not a military nation.

In picturing to ourselves a future war, we naturally, and quite logically assist our imagination with what we know of the latest campaign, and if we study the details of the Russo-Japanese struggle in the Far East, we find that many of the large battles resembled in their nature siege warfare. Heavy guns and howitzers were employed by both sides in Manchuria, whilst a vast amount of digging was found necessary in the preparation of positions. As regards the regular siege operations which led to the fall of Port Arthur, we find that the old system of sapping was resorted to with success, and that the mounting of large pieces of ordnance was essential before the Russian works could be captured.

What were the chief shortcomings of the Japanese besieging force brought to our notice by Colonel Nicolls? They may be summed up briefly as follows:— Firstly, want of co-operation between different branches of the army. The artillery did not continue firing long enough properly to support the infantry, or the latter attacked too soon or too late. Secondly, bad practice, that is, obtaining results with a greater expenditure of ammunition than was necessary.

Let us now ask ourselves what steps should be taken to avoid similar shortcomings in a British besieging force in the future. No one who is acquainted with the annual training now undergone by a siege company will deny that as regards accuracy of fire at a given point an enormous amount of trouble is taken to obtain the best results. Various means of obtaining the line of fire, diverse methods

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of observation, drill with casualties are constantly practised. Reams of criticisms are written, and the life and vicissitudes of each projectile from the moment of its birth till its violent end may be read in our voluminous practice reports. Practice at concealed targets with balloon observation is now no novelty. All our operations, including the most elaborate calculations are carried on against time. Such exercises are useful and tend to accuracy of fire, even when carried out on the uninspiring plains of Lydd. But surely, something more is necessary to bring us in closer touch with the necessities of war. Each year the Siege Brigade proceeds to Lydd or Rhayader to carry out practice, safe from interruption by other arms of the service. The infantry officer may have heard of Siege Artillery and pictures to himself Sebastopol, Paris, or Port Arthur, with huge bombs bursting above the doomed cities, but probably few have realised how united must be the efforts of gunner, sapper, and infantry soldier to ensure success for a besieging army .

The question is:— How can we infuse sufficient realism into our annual training? Or in other words, how can we carry out our training in such a way as to permit of officers and men having opportunities to exercise their ingenuity and powers of discretion in situations similar to those which would present themselves in time of war?

Of the two practice areas which have been in use during the past few years, Rhayader, though possessing many defects, is the more useful and typical. The range of hills, where hitherto targets have been erected or excavated, may well be treated as a defensive position. A reference to the accompanying map will show its merits and faults. The defensive range consists of a high watershed, from which three spurs jut out towards the uppermost lake of the Birmingham water supply. This lake might be considered as a river separating the hostile forces. The ground occupied by the besieging force is a mountainous area, much the same in height as the defensive position. Hitherto the camp of the Siege Brigade has been so situated as to prevent a large portion of the "attackers territory" being utilised for tactical purposes. To enable practical operations to be carried out, the camp should be pitched further East, that is, on lower ground towards Rhayader village.

The following difficulties have to be overcome, or compromised in carrying out a scheme of attack.

(1) Firing cannot take place by night.

(2) The ground occupied by the defenders is mostly boggy, so much so indeed, that the effects of common or lyddite shell are much localised, and little damage to works and personnel can be expected. This does not, of course, apply to shrapnel.

(3) Owing to the presence of the waterworks, large numbers of men cannot camp on the defensive position, but it should be possible to arrange for the accommodation of some twenty men and horses, either West or South of the position, in the vicinity of the farms, of which a few are dotted about the country.

(4) Whatever month be chosen for the operations, the worst of weather must be expected in so mountainous a district, and as it is

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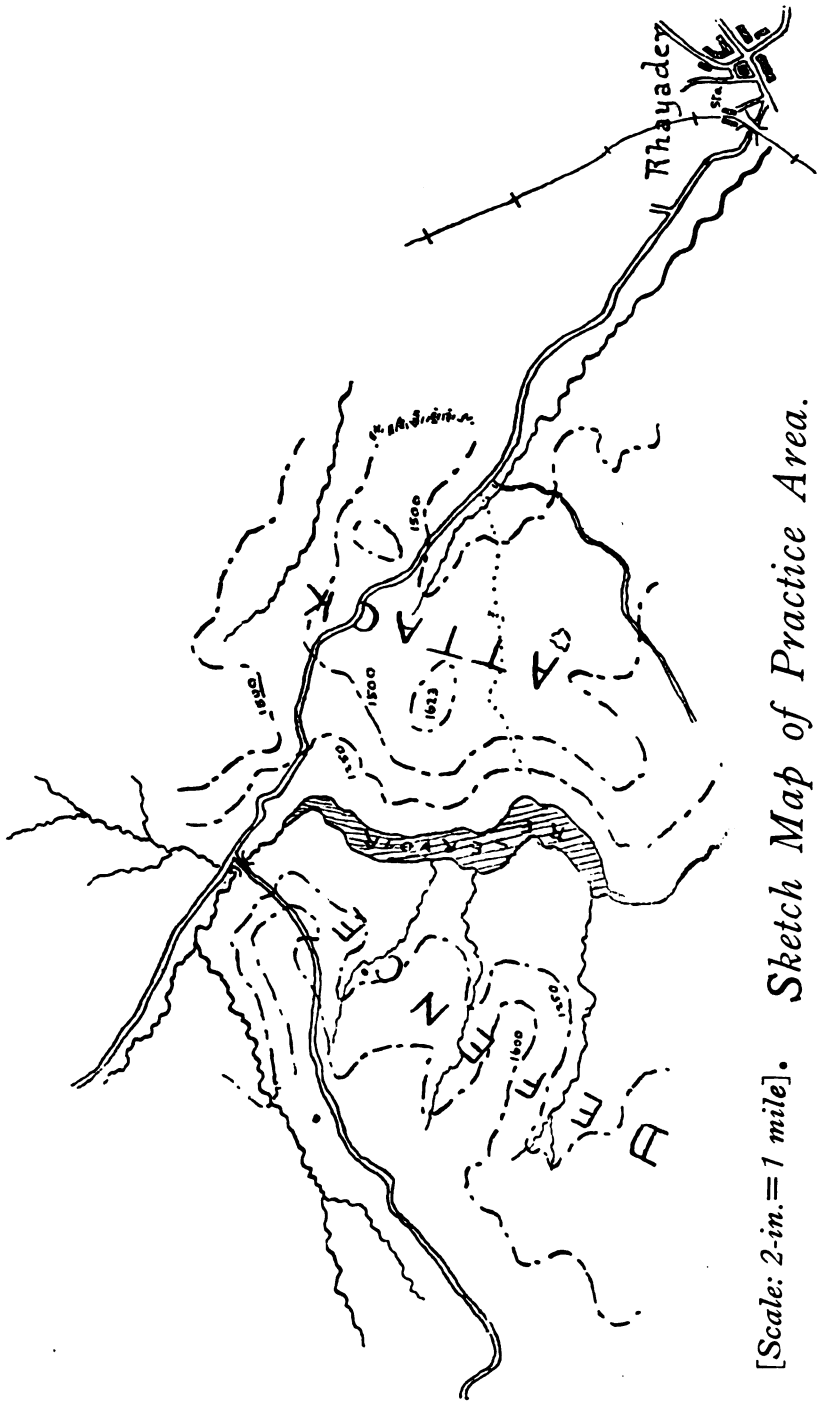

[Scale: 2-in. = 1 mile]. *Sketch Map of Practice Area.*

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not desirable in peace time to make troops undergo prolonged hardships, the operations should not be of too long duration, the most rational dress alone should be taken, and annual inspections of ceremonial nature should be postponed or take place before the camp is held.

(5) In order that the interest of all ranks should be centred on the work to be performed, the usual class firing should not take place. If thought desirable, the companies might be classed according to the skill and efficiency shewn in carrying out the attack.

(6) Owing to possible premature explosions, infantry cannot in peace time be employed in works in front of the guns of the attack, although such risk would have to be incurred in war. The positions of imaginary battalions, however, and their movements should be arranged and recorded by infantry officers as in a "Staff ride." The same remarks would apply to the Royal Engineers, who should also be represented by officers.

Having enumerated the difficulties which militate against realism, I will now describe a proposed scheme for carrying out operations on as practical a basis as these difficulties will permit of.

A fortnight before hostilities are to commence, the range party, consisting of three officers, one of whom should be an experienced Field Officer, and some twenty men, proceed to establish themselves in the vicinity of the defensive position, their camp, of course, not being on the ground to be defended. This range party now prepares the position for defence. Lines of trenches are made in places which they would occupy in reality. These need not be very long or deep, but sufficiently so to give cover to small dummies. The latter should be made of light canvas, gabion sticks, &c., of varying shapes, and of such sizes as to represent men standing, kneeling, and lying down. Most of them would be concealed in the trenches, fastened to short lengths of "clothes line," a pull on which would make them partially visible, to represent men firing. Guns and howitzers, made of light wood and canvas, are placed in position, each with its detachments, ammunition parties, &c. The position must be treated as such, not as a panorama of targets, and for this purpose, several cartloads of canvas and wood would be necessary.

The chief umpire, on arrival, receives a chart showing the details of the defence. He also causes to be prepared maps of the territory to be occupied by the attackers and defenders, divided into small numbered squares.

The Red (besieging) army, represented by the Siege Brigade, accompanied by Engineer and Infantry Officers, now arrives, and is camped on the road from Rhayader. A General Idea is prepared and a Special Idea to suit the situation. Thus, the Red infantry in attempting to cross the river, might be considered to have been repulsed with severe loss by a strong force of the enemy (Blue) entrenched on the slopes of the spurs which commands the reservoir, who may or may not have been supported by artillery fire. The Red C.O. and Staff proceed to reconnoitre the enemy's country. Possibly Red may elect to send up a balloon or kites, in which case Blue has the option of firing at these with howitzers or guns. Should

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he do so, he acquaints the umpire by telephone. Thus, he might send the following message:— "I am firing with four 6 inch howitzers, situated in square B7 at Red's balloon," and at the same time he fires cordite flashes from these canvas guns. Red is informed by the umpire that his balloon is being fired at, and Red will probably try and locate the position of Blue's howitzers. If he succeed, Red may inform the umpire that he wishes to shell Blue's howitzers. The umpire then ascertains if Red is approximately correct in his surmise as to the position of the howitzers, before allowing Red to open fire. This would be necessary in order to avoid waste of ammunition which is too valuable to be expended on a bare hill side.

And so on, the commanders of sides informing the Chief Umpire of their movements and intentions. After practice has taken place, say 15 rounds at a 6 inch battery, Blue reports by telephone on the result, and it is for the umpire to say what he considers the effect would have been had the fire been continued. He may consider the battery to be silenced or partially destroyed or untenable. Should Blue elect to keep his guns silent, then Red moves up his imaginary infantry, and advances one of two Siege Batteries with a view to delivering an assault. If Blue be obliged to fire from his trenches, his "clothes lines" must be tautened, so that his dummies are made partially visible. If Blue fires from howitzers and guns, he must ignite flashes at every gun and howitzer employed. The umpire may, on Blue reporting that Red's movements are very visible, cause a large number of casualties to be made amongst Red's gunners and *matériel*.

Some rules, of which the following are specimens would have to be drawn up.

(1) The hours for hostilities to be fixed by the umpire, say 9 to 12, and 2 to 4. To be modified as required, both sides being informed.

(2) No movements of Red's troops and guns to be made except during hours fixed for hostilities, other portions of the day being considered as non-existent.

(3) Umpires to be conspicuously dressed.

(4) The officers and men of both sides not to be allowed on hostile territory, but during "peace" hours they will be allowed anywhere on their own territory and on the banks of the reservoir, which will be considered as neutral ground.

(5) Owing to the nullifying effect of the boggy ground on lyddite and common shell, their efforts must be judged according to the distance of explosion from guns and dummies.

(6) Fire will only be opened under the sanction of the umpire, who will give directions as to the amount of ammunition to be expended to enable him to judge of the effect of the practice.

The system appears more complicated, perhaps, from the above description than it would be in reality, but I think that there would be little difficulty in carrying it out with experienced range officers. Although at Rhayader the Red Commander would be able to place his guns in good positions in the initial stages of the attack without difficulty, a considerable amount of skill and much digging would be required before the advanced batteries could be prepared, and

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accurate fire at effective ranges would be essential before the defensive position could be rendered untenable, or the Red infantry pushed forward to the assault.

Siege operations are necessarily slow and their deliberate nature renders such a scheme as described the more feasible. As regards the safety of the range party, no difficulty presents itself, as Blue would be invariably informed as to the position of the defences to be attacked, and the range party would thereupon betake themselves to a place of safety.

As regards the pecuniary aspect of the question, there would, no doubt, be some increase in expense, chiefly that entailed in hiring a new camping ground, and in providing a few more horses than has formerly been the custom. The horsing of a medium siege battery in peace time is apparently impracticable, but all that would be necessary would be a few teams of A.S.C. horses and drivers, such as those which were found so efficient at Rhayader in 1905. On the other hand, the expense of transporting obsolete howitzers from Lydd, hitherto incurred owing to the cheapness of their ammunition and their value for training observers, would be saved. The duration of the camp, too, might also be curtailed somewhat to effect a further saving.

It would be safe to assume that great interest would be taken in such realistic siege work by all officers, and by the men too, if the scheme were explained to them, and they were kept au fait with the situation. Amongst the advantages which may be put forward on behalf of the scheme, the following are suggested:—

(1) Practice would be carried out in accordance with a tactical idea.

(2) The system of observation of fire by triangular calculation, and the use of balloons and kites would be practically tested.

(3) The number of casualties made would vary inversely with the amount of skill shewn in selecting and changing positions.

(4) The attention of officers would not be entirely absorbed in the minutiæ of drill, but also in the larger questions which affect the efficiency of siege artillery.

(5) Realistic targets.

The omission of class firing as it is now carried out would not, I think, be detrimental, certainly for one year. It is well known that in all branches of artillery, a certain amount of artificiality ensues when the standard of a battery is judged by the results of a few series fired under fixed conditions, although there is no doubt that these series excite a large amount of keenness amongst N.C.O's and men. As regards the construction of batteries, too, how much more interest must be taken in entrenching when the works undertaken are necessary for the execution of some tactical idea, than in the erection of typical batteries without any precise object.

It is unfortunately true that considerable difficulty must be expected in obtaining land, &c., in this country, but perhaps some patriotic and influential statesmen could bring the proper pressure to bear on this question.

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THE COUNTER-ATTACK.

By CAPTAIN C. C. ROBERTSON, R.F.A.

General considerations:—

THE conduct of the successful defence, in tactics, strategy, and national policy, is governed by the spirit of the counter-stroke.

The term "defensive—offensive" should be avoided. It is a needless, cumbersome, and somewhat mischievous expression, introduced to convey the idea of the counter-stroke in war—the "riposte" of the skilled fencer.

But this attitude is inseparable from the conduct of the defence; except as evinced by the hedgehog. The term, therefore, is likely to be short lived. It is misleading to the military student, who thinks he has two problems to deal with—the "defensive offensive," and the "defence." Possibly he may seek for a third, in the "offensive defensive"!

This idea must be dismissed. Defence implies defiance; though the motto of our Volunteer force suggests the contrary. It is ill chosen.

The counter-attack in national policy:—

Russian aggression in the Far East, and its treatment by China and Japan will repay examination. The national policy of Russia had taken the offensive years before war broke out. The false and the true defence of national interests are sharply contrasted in the passive resistance of China, and the counter-stroke by Japan. China by remonstrances achieved nothing, and her case may be dismissed.

The declaration of war by Japan in 1904 was the national counter-stroke against Russian policy in the Far East. It is true that she assumed the strategical offensive in the delivery of this counter-stroke, and maintained it throughout hostilities. But the absorption of Manchuria by Russia was an attack on Japan's national interests. The occupation of Port Arthur by Russia in 1895 was, to the national policy of Japan, an act of war.

Had Japan refrained from the counter-stroke—the declaration of war—Korea must have become a Russian province. Russia would have achieved this result by acting on the offensive in national policy, without recourse to hostilities.

Japan's defence of her national interests, being deeply imbued with the spirit of the counter-attack proved successful.

A further example of the counter-stroke in national policy occurs in the recent action of Germany in Morocco. Rightly or wrongly,

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the entente cordiale between Great Britain and France, with M. Delcassé in power, was deemed adverse to German interests. A change of ministry was effected by the threat of immediate hostilities to France. The Morocco question was the lever by which this counter-stroke was applied.

The aggressive national policy of neighbouring states caused the rise of Gustavus Adolphus, and Frederick the Great. Alike, they found their kingdoms in danger of absorption by their powerful neighbours. Deliberately they adopted the true defence, by organizing their forces for the counter-stroke. By its timely delivery they not only averted the national danger, but each became in turn the ruling spirit of his time.

The counter-attack in strategy:—

Military History teaches that no nation can win a campaign by acting on the defensive alone. A more active strategy must be adopted when conditions are favourable.

The attitude of the Confederacy throughout the American Civil War illustrates the true defence. Apart from the failure to march on Washington, after Bull Run, (July 21st, 1861) the Confederates lost no opportunity of the strategical counter-attack.

At Kernstown, where the Federals won a tactical victory, Jackson administered a strategical counter-stroke which resulted in McClellan's army of invasion being reduced from 150,000 to 40,000, and the complete paralysis of his designs on Richmond.

Jackson's victory at Winchester (May 25th, 1862) was still more effective. Again, Washington was in danger and the pressure on Fredericksburg was relieved.

The final effort of the Southern States, which ended at Gettysburg was a further instance of the strategical counter-attack. Lee was well aware that the Confederate cause would never be gained by a passive defence.

Moore's Corunna campaign furnishes a good example of the counter-stroke in strategy.

Napoleon's army of invasion crossed the Pyrenees in November, 1808. The Allies were on the defensive. Driving the Spaniards back in all directions, Napoleon entered Madrid on December 4th, while Moore was at Salamanca.

In the belief that Madrid was holding out, and in order to give the Spaniards time to organize their powers of resistance, Moore determined to concentrate with Baird for an attack on the French lines of communications, in the direction of Burgos.

This strategical counter-stroke had the desired effect. Napoleon changed all his plans, for the occupation of the Peninsular, and endeavoured to cut Moore off his base. Napoleon's great march to Astorga was itself the counter-stroke to Moore's threat on the French lines of communication, and forced Moore to retreat on Corunna.

The transition from the defensive to the offensive in strategy is shown in the following examples.

In 1882, the Russians, on the defensive, fell back before the invading French. But they assumed the offensive when the French

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reached Moscow, and very nearly cut off their retreat.

In 1810, Wellington retired before Massena to the lines of Torres Vedras. Early in 1811, he assumed the offensive and drove Massena out of Portugal.

When war broke out in South Africa, the British forces were thrown on the defensive. The counter-attack, directed on Bloemfontein and Pretoria, resulted in the relief of Ladysmith, and the advance from Natal.

Defensive strategy, therefore, relies on the counter-attack for ultimate success.

The counter-attack in tactics. Examples from the eighteenth and nineteenth centuries:—

The campaigns of the eighteenth and nineteenth centuries afford illustrations of the counter-attack in great variety.

It may be the result of forethought as at Austerlitz, or of opportunity, as at Marengo.

The counter-stroke may be forced on the defence, as at Salamanca and Rossbach, to protect the lines of communication.

It may be delivered early in the engagement, before the enemy's reserves are engaged, as at Salamanca, and Austerlitz.

It may be the crowning effort after prolonged resistance, as at Waterloo.

The opportunity may appear after the enemy has broken through the defence, as at Gettysburg, at Spottysylvania (May 10th and 12th), and at the Alma, where the great redoubt was stormed without much difficulty, but recaptured by the Russian counter-attack.

The counter-attack may be used to snatch victory from defeat, as at Marengo, where the French were beaten, until Desaix arrived—and Kellerman made his famous charge.

The counter-stroke may be directed from one flank, to neutralize an attack on the other, as at Wagram.

This course was open to Bazaine at Gravelotte. Had he employed his reserves, in a vigorous counter-attack from his left, the German success at St. Privat might have been neutralized.

The counter-stroke may come from a flank, as at Chancellorsville, and Cedar's Run.

At Austerlitz, Napoleon directed his attack on the allied centre, in reply to an attack on his right.

In studying these examples we find that no precise rules can be laid down for the counter-attack in relation to how? when? and where? There are, however, two conditions necessary for success. These are (1) suitable ground, and (2) correct timing.

The importance of the latter is seen at Austerlitz, Marengo, and Salamanca. A further example is the action of the Prussian cavalry at Leuthen. The Prussian left was thrown into disorder by the Austrian guns. The Austrian cavalry, 80 squadrons strong, wheeled round the right flank of the Austrian position to charge down on the retreating Prussian infantry.

As they formed into line, the Austrian cavalry exposed their right flank, for a few seconds only, to Driessen, (the Prussian Cavalry

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Commander). He fell on their flank with 50 squadrons, sending 10 squadrons to hold them in front.

The Austrian cavalry was overthrown, the confusion spread to the infantry, and the Prussian victory was complete. But, up to the moment of the counter-stroke, the Austrians had none the worst of the engagement.

The counter-attack in the twentieth century:—

The wars of the twentieth century throw no light on the problem of the decisive counter-attack. We gain, however, this important lesson.—In tactics, the attack formation is governed by the spirit of the counter-stroke.

When the defence is true, the attack can take no liberties.

But when the dreaded counter-attack is found by experience to be negligible, the attack formation may be exceptional.

In the South African War the Boer defence was conducted on hedgehog principles. There was no counter-attack.

This rendered a very extended attack formation possible. But the attenuated firing line, with a rifle to every ten or more yards, cannot face a counter-stroke.

The Japanese did not copy our extension. The Russian local counter-attack was a thing to be feared.

But the Russians made no counter-attack on a large scale. Their General Reserve was drawn on to reinforce the firing line. The defence lacked the spirit of the counter-stroke. The common remark in the Russian trenches was "when does the retreat begin?"

The Japanese, therefore, took the liberty of throwing all their strength into the firing line. At Liao Yang, the Sha Ho, and Mukden, they had no General Reserve. They were thus everywhere stronger against the local counter-attack. If, then, the defence is passive only, the attack can take liberties which would otherwise be fatal.

The "lessons" learnt in these wars are very treacherous. The attenuated attack formation was successful against the Boers. The General Reserve was thrown into the firing line against the Russians.

But the counter-attack will alter all this. "The application of force at the vital point" cannot be secured by extended formations. "Victory is to him who has the last reserve" *provided he uses it.*

The counter-attack under modern conditions:—

We have thus learnt nothing from the battles of the twentieth century as to how the counter-attack, on a large scale, is best delivered under modern conditions. Its absence is so marked that we are led to enquire whether an important movement of this nature is now practicable.

The local counter-attack will always be a feature in the defence. But the extent of front involved in modern battle, presents great difficulties to the decisive counter-stroke.

The conditions required in "Combined Training," may be secured if the defending General is singularly blessed by fortune. He will cheerfully "launch his counter-attack when the enemy has expended his reserves, in endeavouring to storm the entrenchments."

This is all very well, if the position is small—with a couple of

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miles of front, the flanks secure, and the ground everywhere suitable for the counter-attack. The General Reserve will be behind the centre, whence it can reach either flank in twenty minutes.

But let the forces be larger—extend the position to ten miles—suppose the communications in rear to be difficult. What then? The General can not be everywhere. He can not regard the whole battle along a front of ten miles.

If he keeps his reserves in the centre, they will have a five or six miles march to either flank, and will arrive at St. Privat all too late.

It seems necessary then to decide beforehand all particulars for the counter-attack. The reserves must be placed in readiness for its delivery, at a point where the ground is favourable.

The counter-attack will generally come from a flank. The stronger flank then must be left to defend itself. The reserves must be on the weaker flank, as we cannot cover both.

The reserves must not be drawn on to reinforce the entrenchments, but every available man must be *added to the reserve.* Then, when the enemy is committed to the attack, the planned counter-attack will be launched over the ground that has been already chosen. Whatever success the enemy may gain in another part of the field must not interfere with the delivery of this decisive counter-stroke. Its effect will allow the defence to recover itself all along the line.

Applying these principles to the Russian defence at Liao Yang, there seems no reason why a decisive counter-stroke was not delivered from the Russian left. Their position—oblique to their line of communications—was similar to Wellington's at Salamanca. Their left was the strategically vital flank. The reserves should have been there; and the counter-attack, delivered in force and pushed home, might have reached the Japanese communications. They would, indeed, have found no General Reserve to oppose them!

There was a semblance of a counter-attack from this flank on the last day of the battle, but it was not pushed home. The strategic movement to the rear had already begun. The commander of this counter-attack cannot be blamed if he failed to cover much ground. It is at least necessary to be sure that the defence is sticking to the entrenchments while the counter-stroke is being made. To be aware that your friends are entraining in rear, does not give the counter-attack much stomach for the fight.

At Liao Yang the Japanese were only saved by the lack of enterprise and decision of the Russian Commander in handling his reserves.

At Mukden they were again indebted to him. If ever the defence had the advantage of the attack it was at Mukden. The Russian love of positions and fortifications was their undoing. Their position was too good. They were glued to it.

In a line of battle twenty-five miles long, if the attack succeeds in *fixing the defence down* to a position, victory is certain. Mobility is the only safeguard against destruction.

Analysis of the Russian failure at Mukden:—

What advantages had the defence at Mukden? That is, what conditions were favourable to a decisive counter-stroke?

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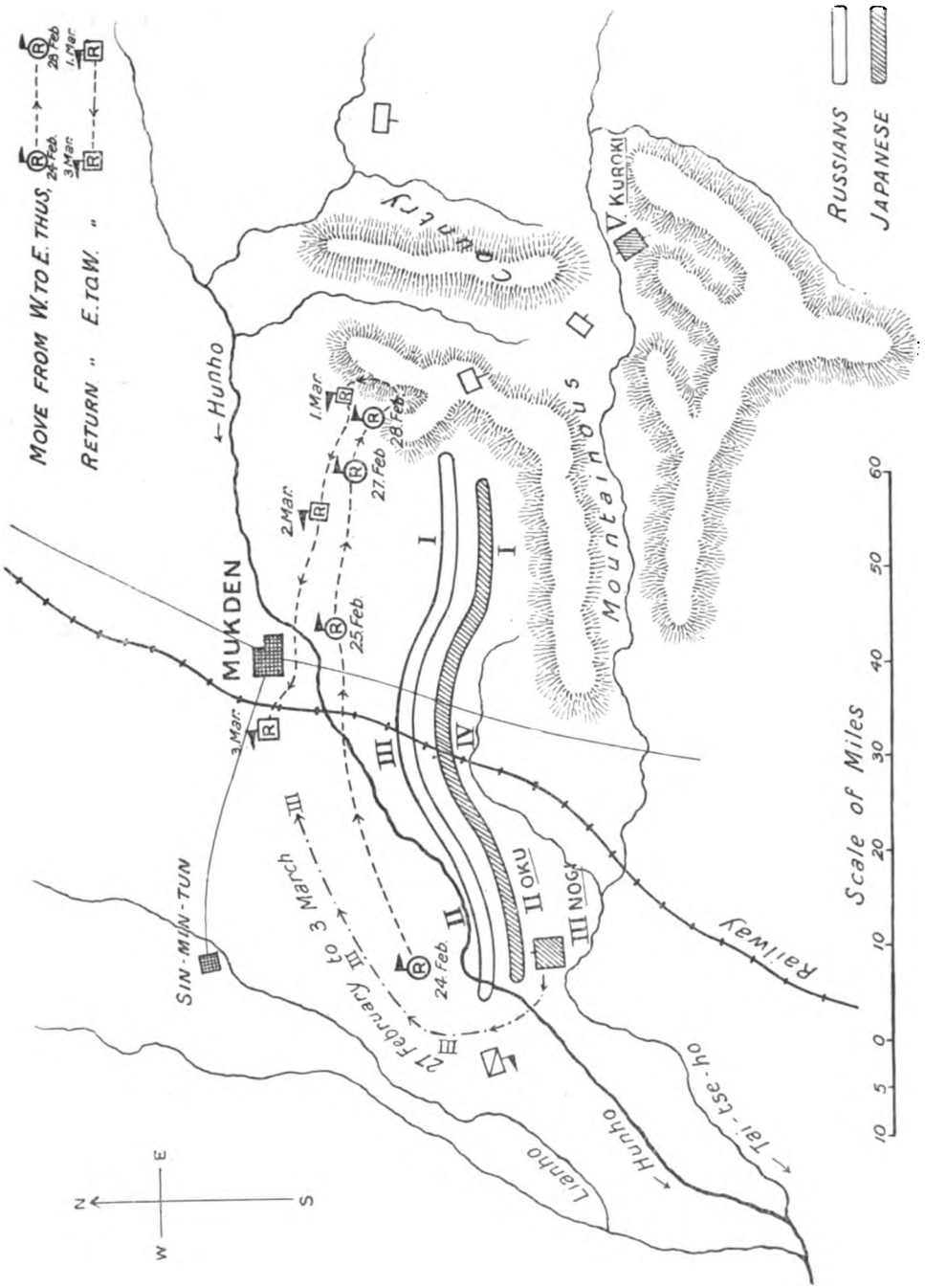

Sketch map to illustrate movements of II. Army Reserve (I. Siberian A.C.). between 24th February and 3rd March (evening).

NOTES:—The position of the Russian and Japanese Armies are given for 21st February.
Nogi's turning movement began on 27th February; and on 3rd March his left flank was 12 miles W. of **Mukden.**

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1. *Numerical superiority.* The Russians had 380,000 men and 1,400 guns. The Japanese had 320,000 men and 954 guns. The balance in favour of Kouropatkin was 60,000 men and 446 guns. The wonder is that he adopted the defensive at all!

2. *The Russian Army was entrenched.* All the resources of field engineering were employed. There were large redoubts with wide and deep defiladed communications, wire entanglements, military pits, electric and automatic fougasses, roads connecting front and rear, siege gun batteries protected by epaulments, ammunition dépôts in the trenches, a broad guage railway connecting the centre and left, telephonic communication between the work and headquarters, electric searchlights, observation towers 68-feet high. Nothing in fact was neglected.

How was it they lost? The Russian army fought with the greatest energy from 25th February to 4th March, carrying out constant local counter-attacks by day and night.

What gave the Japanese the victory? *It was the absence of the decisive counter-stroke,* due to the mishandling of the Russian reserves.

The Russian reserves at Mukden:—

The Russians were formed in three armies—right, centre, and left, each with its own reserve, and a General Reserve at Mukden.

Kouropatkin was led to believe that the serious fighting would be on his left wing.

When Kuroki opened the battle against that flank, Kouropatkin transferred the reserve of the Russian right wing to the extreme left —a four days march. That lost him the battle. When Nogi (concealed at first behind Oku) swung round the left of the Japanese army, the Russian dispositions on the right wing collapsed like a house of cards.

The tactical error in moving the reserve of the Russian right wing away to the left, was the greater, since behind the centre of the Russian line of battle was an Army Corps in reserve.

The reserve (1st Siberian Army Corps) of the Russian *right wing* marched right across the front of this *central* reserve, and back again. They were eight days over this unfortunate error. The Russian right wing was left *en l'air,* and inviting envelopment.

Kouropatkin should have known that the decisive action would be fought on his right wing. The country in front of his right was open—favourable for movement of large forces; suitable, therefore, to attack, and counter-attack. On the left the mountains rendered all movement difficult, and a decisive counter-stroke impossible. The question of topography alone should have settled the position for the reserves.

Russian opportunity for decisive counter-stroke on March 3rd:—

But even under the conditions resulting from the envelopment of the Russian right wing, Kouropatkin had an opportunity of rolling up Nogi's army on March 3rd.

On March 2nd arose a situation that made a turn in the fortune of war possible. The moment for the counter-attack arrived when the Japanese envelopment had become a long thin line without reserves. At a distance of nine miles behind the outermost left wing of Nogi's

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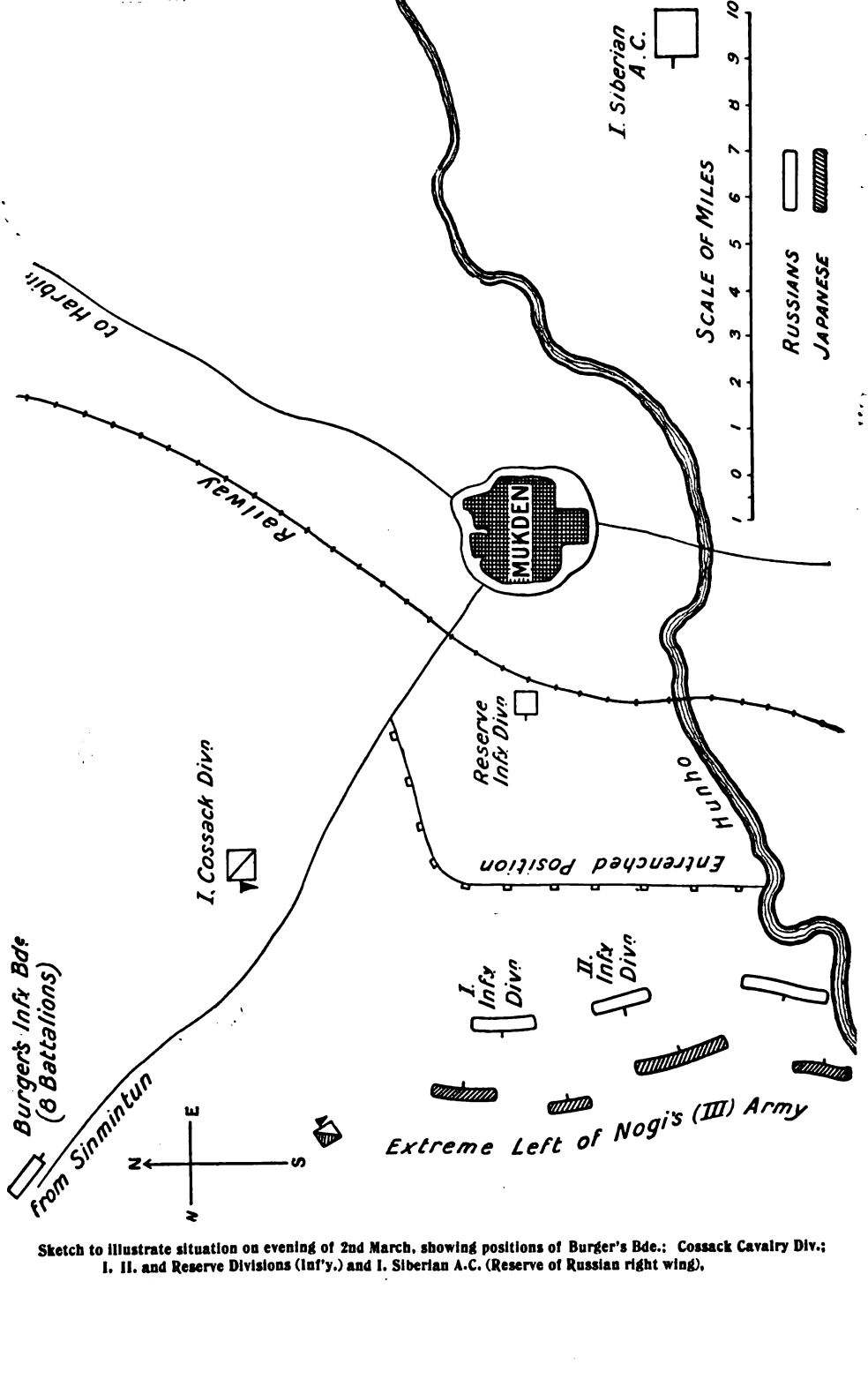

Sketch to illustrate situation on evening of 2nd March, showing positions of Burger's Bde.; Cossack Cavalry Div.; I. II. and Reserve Divisions (Inf'y.) and I. Siberian A.C. (Reserve of Russian right wing).

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army was the Russian Infantry Brigade (8 battalions) of General Burger—returning from a reconnaissance towards Simintun (20 miles West of Mukden).

Between Burger and Mukden a strong cavalry division kept connection.

The entrenched line West of Mukden was occupied by two Russian infantry divisions, with a third in reserve.

By a short march early on the morning of March 3rd the juncture could have been effected of Burger's brigade, the cavalry division, and the reserve infantry division, all on the left flank of Nogi's army. The Japanese would be engaged in front by the two infantry divisions of the entrenchments.

Nogi's army must have been rolled up, and by this counter-stroke victory was in the grasp of the Russians. It must be remembered that the Japanese *had no reserve* behind Nogi's army.

How much more overwhelming would the Japanese defeat have been if besides the above combination, the Reserve Army Corps of the Russian right wing had been at hand to make the blow irresistible. As it was, however, Burger felt himself isolated, and worked right round the wings of both armies, coming up into line with the front of his own army South of Mukden.

The Japanese dispositions at Mukden were impossible in the face of a determined counter-stroke. The Russians lost their chance by assembling their reserves on that wing which was topographically unsuited to the counter-stroke.

Napoleon's campaign of 1814:—

As a last example we have the campaign of 1814 as the model for defensive warfare.

Napoleon, manœuvring between the allied armies always took the offensive. His numerical inferiority never induced him to take up a defensive position. And he beat the allies at Bar-sur-Aube, Craonne, Laon, Reims, and St. Dizier, by successive counter-strokes.

Conclusion:—

In conclusion, let us determine how the General Reserve will in future be constituted. The enormous extent of the modern battlefield excludes the infantry from the General Reserve. This rôle in future belongs to the cavalry and mounted infantry, with horse and field artillery, howitzers, machine guns and mounted engineers.

The General Reserve—the force to be applied suddenly at the vital point—must be capable of rapid movement, without which no counter-stroke can succeed. The element of surprise is necessary.

A General Reserve thus constituted will be able to ward off blows, or bring about a decisive result, at any point in the struggle. The cavalry will fight on foot, and the mounted infantry will find its true rôle—the force of trained infantrymen, necessary for the counter-attack, and capable of rapid transfer to the vital point.

Such is the future of the counter-attack. It will pierce the attenuated firing line, roll up the extension which has no reserves, and strike at the enemy's communications.

The defending General may feel confident of the issue.

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A Suggested System of Ranging Howitzers from a standard of yards instead of a standard of degrees.*

By COLONEL S. W. LANE, R.F.A.

IT has always appeared to me that if howitzers could be ranged for all charges in units of yards instead of degrees, the process of ranging would be very much simplified, for officers in general.

This has hitherto been looked on as impossible owing to the different charges. It would do away with the writing down, many officers have to carry out at practice. It is suggested that this can be done by graduating the drum of the goniometric sight in yards for full charge, instead of degrees and minutes. It can be seen from the simple range card attached, which is only roughly made out for a few ranges, from the degree scale now in use, that the elevation can be given on the same drum for the different charges.

A new howitzer is to be introduced with more charges than the present one, the question with reference to the system of ranging is worth studying, as it may tend to simplicity and most officers I have shown it to think it does. This system might quicken the howitzer batteries, the words of command would be given much quicker as the figures appeal to one more than degrees and minutes—Degrees are shown on the card as a guide for Angle of Sight with fuze. "For example" Range takers give 1,100 yards, then from the card it is seen that—core only is the charge—Bracket to be given for guns 36—42 from card—Verified say at 40—If it were a charge that a fuze could be used with, the length is shown to commence verification with.

This is only a suggestion. Perhaps some other officer can improve on it.

Full.	Fuze	Degrees	Core² 2	Fuze	Degrees	Core² 1	Fuze	Degrees	Core	Degrees	Defl'n. 20 Yds.	
1000	7	4·40			6·31	1900		9·44	3200	18·49	1° 10″	
			1300	7¾		2000						
1100			1400			2100			3600			
			1500			2200						
1200		5·44	1600		7·55	2300		12·00	3900	24·9	55″	When line of descent of 20° begins — blue line to be made.
						2400						
1300				10¼		2500			4200			
			1700			2600						
1400		6.48	1800		9·22	2700		14·27	4500	31·36	50″	Line of descent 30″ begins dotted line to be made.
			1900			2800			4800			
1500	10¼		2000			2900						
						3000						
1600		7·55	2100		10·55	3100		17·6			45″	
			2200									
1700			2300	13¼		3200						
1800		9·4	2400		12·33	3300		19·56			40″	

* Both of these represent different distances in range with the several charges.

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The British Artillery at Waterloo, June 18, 1815.

By CAPTAIN A. F. BECKE, (late R.F.A.).

As the Waterloo Campaign is now especially engaging the attention of many officers in the army, it is thought that some details as to the British Artillery units engaged in the great battle may prove both interesting and useful, to those artillery officers who are studying the Campaign. It is, however, somewhat difficult to obtain these details, unless the student happens to be in touch with a good military library, for the best accounts dealing with the incidents described are contained in books, that for some time have all been out of print, and which are becoming increasingly difficult to obtain.

The Staff of the Royal Regiment at Waterloo was composed as follows:—

Colonel	Sir G. A. Wood,	Commanding	Royal Artillery.
Lieut.-Col.	Sir A. Frazer, K.C.B.,	"	R.H.A.
"	S. G. Adye,	"	Artillery 1st Division.
"	Gold,	"	" 2nd "
"	Williamson,	"	" 3rd "
"	A. Macdonald, 6 Troops, R.H.A., attached to Cavalry.		
Major	Drummond, Reserve Artillery.		

(Lieut.-Col. Sir J. Hartmann, King's German Legion Artillery).

On Staff of O.C., R.A.:—

Asst. Adjt. General Lieut.-Col. Sir J. May.
Brigade Major Captain H. Baynes.
Staff Officers: Captain Pakenham, Lieut. Coles, Lieut. J. Bloomfield, and Lieut. W. Bell.

The troops of *Horse Artillery* attached to the cavalry were:—

Captain & Brevet Lieut.-Col. J. Webber Smith's Troop, (F Troop), afterwards B Battery B Brigade, 1864; now D Battery, R.H.A.

Lieut.-Col. Sir R. W. Gardiner's Troop, (E Troop), afterwards A Battery, B Brigade, 1864; now E Battery, R.H.A.

Major R. Bull's Troop, (I Troop), afterwards D Battery, B Brigade, 1864; now I Battery, R.H.A.

Major William Norman Ramsay's Troop, (H Troop); reduced in 1819, reformed 1857; afterwards D Battery, A Brigade, 1864; now H Battery, R.H.A.

Captain A. C. Mercer's Troop, (G Troop), afterwards C Battery, B Brigade, 1864; now G Battery, R.H.A.

Captain & Brevet Major E. C. Whinyates' Troop, 2nd Rocket Troop, Royal Horse Artillery, reduced in 1816; now O Battery, R.H.A. Honors of the Rocket Brigade were given to O Battery—vide "Army Orders," 112 of 1901.

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The following Horse Artillery Troops were in reserve at the commencement of the battle, but early came into action:—

Captain & Brevet Lieut.-Col. Sir H. D. Ross's Troop, (A Troop), afterwards A Battery, A Brigade, 1864; now A Battery, R.H.A. (The Chesnut Troop).

Major G. Bean's Troop, (D Troop), reduced in 1816; reformed in 1900 as V Battery, R.H.A.

Total R.H.A. in the battle:—
1,368 all ranks, with 42 guns and 6 howitzers.

The *Divisional Artillery* present was as follows:—

Captain C. F. Sandham's Brigade, 3rd Eattalion, reduced in 1819; reformed in 1848 as 3rd Coy., 11th Battalion; now 7th Battery, R.F.A.

Captain S. Bolton's Brigade, 9th Battalion, afterwards E Battery, 8th Brigade, 1861; now 42nd Battery, R.F.A.

Major W. J. Lloyd's Brigade, 10th Battalion, reduced in April, 1817; reformed in 1846 as 2nd Coy., 10th Battalion; now No. 8 Coy., R.G.A.

Captain & Brevet Major T. Rogers' Brigade, 3rd Battalion, reduced 1817; reformed 1848; afterwards 7th Battery, 13th Brigade, 1859; now No. 54 Coy., R.G.A.

The following Brigade was attached to the Reserve Artillery, but came into action early in the day:—

Captain J. Sinclair's Brigade, 3rd Battalion; afterwards 4th Battery, 3rd Brigade, 1859; now No. 101 Coy., R.G.A.

Total R.A. in the battle:—
501 all ranks, with 27 guns, and 3 howitzers.

It will thus be noticed that 13 Troops and Brigades of the Royal Regiment of Artillery were engaged in the Battle of Waterloo, with a total number of 78 cannon (69 guns, and 9 howitzers).

Positions of troops and batteries R.H.A. and R.A. at 7 p.m., 18 June.

R. 1st Position of Rogers' Battery, where Genl. Sir T. Picton was killed.
K. Position of Cleeves' K.G.L. Battery.

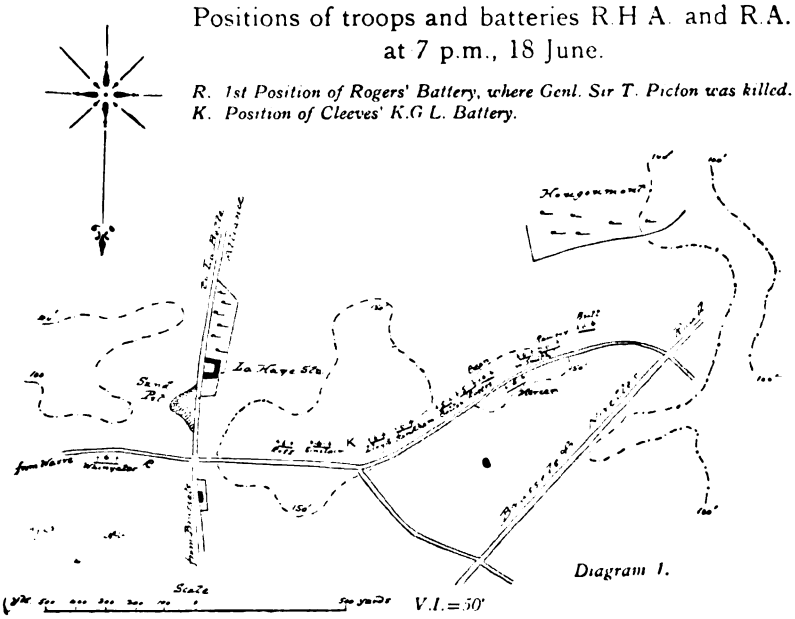

Diagram I.

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Other R.A. units were in the vicinity but were not actually present at the battle; a few other brigades were, however, represented by detachments who were present in charge of small arm ammunition.

The foregoing is exclusive, of course, of the Brigades of the King's German Legion, or Hanoverian, Artillery. One of these brigades was attached to each of the 1st, 2nd, and 3rd Divisions, together with the British Brigade allotted as already shown.

We will now take each of the Troops and Brigades and pass in brief review its share in the eventful day; reserving the longest description for that troop which especially covered itself with glory in the battle.—I naturally refer to Captain Mercer's Troop of R.H.A.

For the positions of the various Troops and Brigades in action vide diagram I.

(Lieut.-Col. Sir R. W. Gardiner's Troop remained all day with Vivian's Cavalry Brigade on the left of the Allied Line, and accompanied it in the general advance at the end of the day, it is, therefore, not included in Diagram I.).

ROYAL HORSE ARTILLERY.

Capt. & Brevet Lieut.-Colonel J. Webber Smith's Troop, R.H.A.
(Armament—Light 6-pounders).

This troop first came into action in the field near Hougoumont, a little in front of the Sunken road. Here the troop was hotly engaged in repulsing the attack on Hougoumont; it suffered severely from a French battery which supported the attack. When the attacking troops became defiladed by the buildings of the Chateau, the troop withdrew, refitted in the Hollow way, and then once more came into action on the left of Major Bull's Troop. The personnel of the troop took shelter in the allied infantry squares (in accordance with the Duke of Wellington's orders) when the French cavalry attacks were pressed home on the plateau, all ranks returning to ply the beaten masses of the enemy with shot when they, on each occasion, surrendered the plateau. The troop was not ordered in pursuit.

Lieut.-Colonel Sir R. W. Gardiner's (K.C.B.) *Troop, R.H.A.*
(armament—light 6-pounders).

At Enghien on June 16th, 1815, this troop joined the main body of the cavalry, and was attached to Sir H. Vivian's (6th) Cavalry Brigade of Hussars (10th, and 18th Hussars; and 1st Hussars K.G.L.). This troop took part with the cavalry screen that covered the retreat from Quatre Bras to Mt. S. Jean, on June 17, the retreat of the guns for the whole distance, some 6 or 7 miles, was conducted at a hard gallop. Vivian's Brigade on June 18 was on the extreme left of the allied line, and the troop remained with it.

It is interesting to note that, at the very commencement of the heavy cannonade which opened the battle, the officers of this troop distinguished a stationary picquet (or patrol) of Prussians, visible through their glasses, and posted on an eminence at a considerable distance away to their left. Thus at 11.35 a.m. the Prussians had established contact. When two guns of this troop first came into action, a large calibre shell from the great French battery (of 84 guns) passed through one of the ammunition boxes and blew it up.

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This troop opened fire on the French when in full retreat, and from then onwards acted independently of its Cavalry Brigade; alternately advancing rapidly, and then halting to fire when the advancing cavalry permitted a clear view of the foe to be obtained. In the confused mêlée, as the light was failing, this troop came under the fire of a Prussian horse battery, just when the troop was limbering up preparatory to a further advance.

Major R. Bull's Troop, R.H.A.
(armament—Heavy 5½″ howitzers).

This troop left bivouac at 8.30 a.m. on June 18, and formed on the right flank of the Heavy Cavalry Brigade, (commanded by Major General Sir W. Ponsonby, K.C.B.) on the left of the road from Waterloo to Genappe. Later it moved to the heights on the right of the first line, and opened fire with spherical case shot, on the enemy who had obtained lodgment in the grounds of Hougoumont, at a range of some 1,000 yards. Afterwards fire with common and spherical shells was opened on the heavy assaulting columns of French infantry, with good effect. The troop was opposed at first by 16 French guns, later reinforced to 22. These guns were well served, and their fire "annoyed us considerably."

About 2 p.m. the troop withdrew out of action, and having completed ammunition, moved forward and came into action, during the charges of the French cavalry, between the infantry squares of the second line. On the second charge of the French cavalry being repulsed, the troop pushed forward and once again came into action in the front line, but some 200 yards in front of its original position. The French guns on the right, now enfiladed the troop and galled it extremely, two pieces were, therefore, directed to silence them, and this object was fortunately achieved. On the general advance taking place, the troop advanced and assisted it by fire as far as possible. With reference to the effect of Major Bull's fire, it is interesting to note that Major Norman Ramsay (on his left), who could see its effect on the enemy's attacking column more clearly than could Major Bull, sent word to the latter that some of the shells opened a perfect lane through the column. Major Bull considered that the effect of the spherical shells was generally very great, and only two shells, out of the whole number fired on June 18, did not burst well.

Major W. Norman Ramsay's Troop, R.H.A.
(armament—9-pounders).

Major Norman Ramsay, who had won imperishable renown for his gallant feat of arms at Fuentes d'Onor, in 1811, and had suffered so cruelly after Vittoria in 1813, was killed in the battle of Waterloo in command of his troop. His death occurred whilst the French cavalry charges were in progress. He was buried during the battle in a momentary lull of the fire; all assisting shed tears, but the mourners had perforce to change their sad thoughts for energetic action, as it became necessary at once to return and renew the struggle.

The fire of the troop was later directed against the attacking columns of the Imperial Guard, and a fire was kept up on this target from the time it left La Belle Alliance, until it reached the crest of the position near La Haye Sainte. The British infantry (Adams'

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Brigade) deployed on the flank of the French column at this moment and shut the enemy out from the view of the troop, who had perforce to cease firing.

Captain A. C. Mercer's Troop, R.H.A.
(armament—9-pounders).

(NOTE.—Captain Mercer commanded this troop on June 18 owing to Lieut.-Colonel Sir A. Dickson being detached to command the Battering Train).

This troop was attached to Lord Uxbridge's cavalry to cover the retreat on June 17, from Quatre Bras to Mont. St. Jean. Whilst still in action, waiting for a target to appear from the direction of Quatre Bras, a single horseman was seen to emerge suddenly from a dip of the ground, followed by a small escort. It was the Emperor himself. He was easily recognizable, and his silhouette thrown forward in strong relief against the illuminated distance was unmistakeable. A volley was poured into the little party from Mercer's guns, but several French squadrons appeared, and the Emperor calling up a mounted battery of his guard, Mercer's position became dangerous and he hurriedly retired. The thunderstorm now broke, and the retreat was conducted in mad haste, at the pace of a fox hunt, and followed closely by the Emperor and his mounted troops, for Napoleon was seeking to make up some of the hours that had passed unutilized on this day. The troop eventually reached the main allied position on the plateau of Mont. St. Jean, and bivouacked on the night of June 17-18 in the orchard adjoining the farm of Mont. St. Jean. On June 18 Mercer went into the farm. During his short absence at the farm the troop was left alone, the other troops having moved off, and Mercer found it thus on his return; he at once moved out of the orchard on to the right of the road to La Belle Alliance and awaited further orders. A heavy gun and musket fire had already commenced to his front. He thereupon started the troop up the high road. But it was already past noon when Major Lloyd, R.A., much agitated, met the troop, and begged for its support. Mercer was moving in that direction when Major MacDonald met him, and ordered him (to his disgust) back to a preparatory position. Luckily the wait was short for the Adjutant of the R.H.A. (Lieut Bell) brought orders for the troop to come into action on the right of the second line, and in front of the 14th Infantry Regiment (West Yorkshire Regiment), lying down in square. The orders were not to engage the French Artillery, but the fire was to be reserved for assaulting bodies of troops only. Sir John Bloomfield (on Sir George Wood's Staff) carried this order to all the troops and brigades, and he was confident that with one exception it was observed. However as the battle proceeded the Duke saw a French gun on the right of the Nivelles road struck by a shot from one of the English batteries, and under the impression that it came from Captain Sandham's brigade, he sent orders to have that officer placed in arrest. This was not done, some satisfactory explanation being given which relieved Captain Sandham of the responsibility.

Singularly enough the offender was never discovered at the time, nor indeed for years afterwards; but in 1870, with the publication of General Mercer's diary, there came the confession of the crime.

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He frankly owns that tired of standing idle, and annoyed too at the fire of the French guns on the Nivelles road, he ventured to commit a folly that must have met with prompt punishment had only the Duke chanced to be in the vicinity. He opened a slow, deliberate fire at the light French guns, to the West of the Nivelles road, hoping to overpower their 4-pounders with the heavier metal of the troop. Mercer's astonishment can be imagined, when his very first shot was answered by at least six larger calibre pieces, until then carefully concealed to the East of the Nivelles road. He at once recognised his mistake and ceased firing. The French followed suit, and only the 4-pounders kept up the cannonade as before. As Mercer's troop was placed near Captain Sandham's brigade at this time, it is clear how the mistake arose as to which Battery Commander was responsible for the evasion of the Duke's order.

Of the main battle during this interval practically nothing could be seen, for the ridge which the first line held commanded that of the second line. From time to time bodies of cavalry swept over it and vanished. Towards 2 p.m. the charges culminated in a general charge by the French cavalry on the front line of squares, and so large were the numbers engaged that they quite filled the interval between the first and second lines. Of the first line nothing was visible save the deserted guns. However after a period of confused mêlée the cavalry drew off, and at this moment (3 p.m.) Sir Augustus Frazer, R.H.A., (Commanding) came and led Mercer's troop to a new position in the first line. The troop moved at a gallop. *En route* Sir A. Frazer informed Mercer that the Duke's orders were positive, and that in the event of the French cavalry persevering and charging home, the men were not to be exposed, but were to retire into the adjacent infantry squares. Sir Augustus before leaving the troop pointed out its position between two squares of Brunswick infantry, and again repeated the Duke's instructions. Captain Mercer took careful stock of the Brunswickers, and decided that the rank and file of the two squares were too unreliable in appearance, for him to feel justified in trusting his men to their protection; to have sought refuge among such troops would have been madness, for the moment the gunners forsook their pieces would have been the signal for the immediate dissolution of the squares, and all would then have been at the mercy of the long swords of the Cuirassiers. Captain Mercer, therefore, determined to say nothing about the Duke's order to the men of his troop, and to let his command take its chance fighting their guns. This wise resolve he maintained all through the long summer afternoon, and the effect of his troop's fine discipline was undoubtedly good on the Brunswickers, and their morale visibly improved as the day wore on. In the position now occupied by the famous troop the ground was some 2′ or 3′ lower than that immediately to their front, and, as the rise was abrupt, the guns in action were covered by a natural epaulment. As the troop arrived a heavy cavalry column of Horse Grenadiers and Cuirassiers was actually advancing on it at a rapid pace. If caught in column of route the troop would be annihilated, luckily there was just time to get into action. The troop deployed, and each gun as it came into line opened fire, and the

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demoralised infantry, on each hand, feebly seconded Mercer's efforts with a desultory fusillade. No wonder, for most of the privates in the two squares were not more than eighteen years old, and they had seen enough of the great Emperor's nerve-shaking methods of attack to terrify far older and more war worn men. The French cavalry continued their advance at a trot, until only some few yards away, and looked like overwhelming the troop; fortunately at the last moment they went sharply about, and broke up into a confused crowd. Mercer caused each of his 9-pounders to be loaded with a round and a case shot, and the carnage in the enemy's ranks was frightful ere they finally quitted the plateau. Some few burst a desperate way to safety between the guns of the troop, but the majority fought with one another in their endeavour to cut a way to the rear, where safety alone appeared to lie. Leaving the ground encumbered with dead and wounded, the wreck of this column finally sought shelter in a fold of the ground, from whence only the bearskins of the Grenadiers were visible. The troop thereupon ceased firing, and the gunners rested themselves after their truly heroic efforts.

The second effort by cavalry was wisely preluded by the advance of a swarm of skirmishers, whose fire was most galling, however their object was plain enough, namely, to induce the guns to waste ammunition on a mere screen. This Mercer refused to do, and correctly waited for the real attack which he knew would not long be delayed. The attack was then delivered by the reformed cavalry column once more. The pace was terribly slow, only a little faster than a walk. Mercer, realising the destructive and unnerving effect of point-blank discharge, held up his fire until the column was close upon him. The column was brought to a stand, fell into confusion, and being subjected to an overwhelming fire of case at a range of some 20 yards, finally gave ground leaving in front of the troop an enormous heap of dead and wounded.

Three times this attack was renewed, with ever fainter prospects of success, for the position of the troop became more and more inaccessible after each attack. Just as the last had been overwhelmed the troop were prevented from plying the withdrawing débris with shot, by the Duke and his Staff, who arrived from the rear and rode along in front of the guns, and masked their fire.

The whole line now advanced, and descended the plateau towards the valley in front. The allied cannonade everywhere slackened as their own indomitable infantry closed with the retiring panic-stricken rabble that had once been the Grand Army. As the line reached the valley bottom, the enemy's masses, on the far hill side, became once more uncovered, and fire was reopened on them.

And now happened the dramatic finale that overwhelmed the gallant troop, and which is so clear an illustration of the tremendous confusion of the battlefield, "the rudderless confusion of the fight" as Hoenig has it; suddenly, as if dropped from the clouds, a battery opened on the troop a terrific enfilading fire at a range of only some 400 yards. The effect was disastrous. Every shot took effect. The whole day had not cost the troop anything like this, and consequently to save the troop from annihilation the two left flank guns were turned

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on to the enfilading battery, so as to keep down their deadly fire. Very shortly afterwards a very excited Black Brunswicker Officer galloped up, and asserted that Mercer was killing his good friends the Prussians. It was in vain Mercer replied that in such a mêlée one could tell the tree only by the fruit, and that this fruit was deadly in the extreme, and that if the enfilading battery was Prussian, then they were acting most discourteously to their English allies. The Black Brunswicker would not be appeased, and fire against the enfilading battery was suspended. The shot from the Prussians came in thick as hail, and far more deadly. Finally the officer was induced to ride round and attempt to get his friends to cease firing on their allies; and Mercer's troop were only saved from utter annihilation by the timely arrival of a Belgic Horse Artillery Battery which came up between the troop and the Prussians, and thus taking the latter in flank, drove them off. About this time the allied infantry advance up the further slopes of the valley once more masked the fire of their guns, but the enemy's masses on the far side dissolved, and streamed away from the fatal field in confused multitudes of played out rubbish. (Only the Old Guard stood firm, and were worthy of their proudest traditions; but what could a few battalions achieve against two armies?)

An aide-de-camp now galloped up to Captain Mercer, shouting out "Forward, Sir! Forward! It is of the utmost importance that this movement be supported by artillery." Captain Mercer merely pointed to the remains of his famous troop, it was a wreck, and a confused wreck too, for as the strength of the troop diminished the necessarily neglected recoil of the guns had gradually brought them back together into a jumbled heap of locked trails, and of the 200 horses no less than 140 were killed or wounded. The excited A.-D.-C., abashed at the folly of his ill-delivered message, glanced at the miserable remains of the troop and rode off.

In front of Captain Mercer's position the heap of slaughter was far greater than on any other part of the Field, and Sir Augustus Frazer afterwards told Captain Mercer, that in riding over the French position he could distinctly see where the Troop had stood from the dark pile of bodies in front of it. This heap of corpses (of men and horses) was a remarkable feature of a battlefield on which the 45,000 killed and wounded were only distributed over some three square miles of ground.

The troop being immobile bivouacked in the position it had so nobly maintained during those critical hours. Major Bull's Troop also bivouacked close at hand on the position it had occupied in action. Later several batteries of Prussian Artillery marched up, and established their bivouacs in the vicinity.

The diagram II. shows the various positions of Captain Mercer's Troop on June 18, also the position of the Belgic Horse Battery, and the supposed position (as accurately as Captain Mercer could remember in 1834) of the enfilading battery. Diagram III. attempts to show the final positions of Captain Mercer's six guns at the close of the action.

(Captain Mercer's Journal should be read by all artillery officers.

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Positions of Captain Mercer's troop on 18 June.

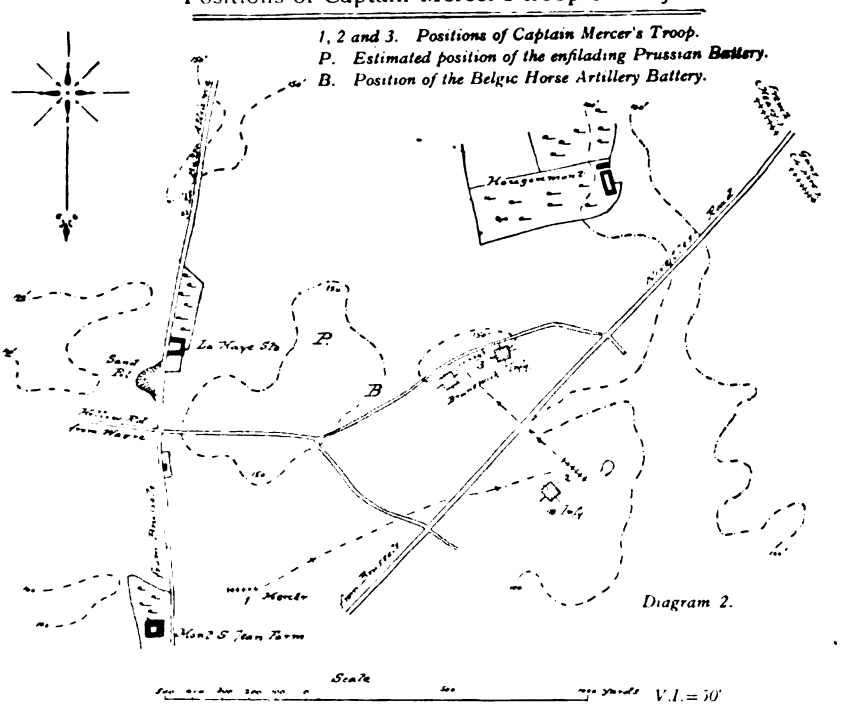

Diagram 2.

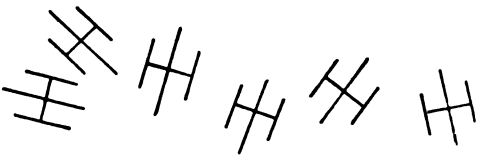

Diagram 3.
Position of the guns of Captain Mercer's Troop at the close of the action.

For a graphic eyewitness account of a great battle it is almost unrivalled. Hoenig's account of Gravelotte is finer and better reasoned, but he was not a participant. Further, Captain Mercer walked over the field of Waterloo next morning in cold blood, and his remarks are most valuable. If the account of June 18, in his Journal is studied together with Colonel Kennedy's "Battle of Waterloo," a most clear and vivid picture of that phase of the great battle which raged with ever increasing fury and violence, on the West of the Brussels—Genappe road, is obtained).

Captain & Brevet Major E. C. Whinyates' Troop, R.H.A.
(armament—Light 6-pounders and Rockets).

The troop, on the turn out sounding on the morning of June 18, assembled on the low ground behind the position, and on the left of the road running to La Belle Alliance. The troop was ordered forward when the first British cavalry charge took place, and Major Whinyates was directed to leave his guns and advance with the Rockets, down the forward slope of the position. He obeyed, and

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fired some ground rockets, but the very high grain crops screened the French line; he was then ordered back, and rejoined his guns in orderly fashion and unpursued.

After the charge of Ponsonby's Brigade of Heavy Cavalry and the return of the rockets to the guns, two guns (as well as rockets) of the troop were sent forward to the abattis on the main road. The fire was too hot to bring up the guns, and only some rockets were fired. Later the Troop took up the ground vacated by a Dutch Brigade of Artillery on the left of the Genappe road. A Brigade of French Horse Artillery (eight pieces of 8-prs), which had come into action covering their broken cavalry, were totally disabled by the guns of the (Rocket) Troop towards 5 p.m., and on the French retreat at 8 p.m. the debris of their Horse Brigade was left on the ground.

This troop fired 309 shot, 236 spherical case, 15 common case, and 52 rockets in the battle of June 18.

Captain & Brevet Lieut-Colonel Sir Hew D. Ross's Troop, R.H.A.
(armament—9-pounders).

At the commencement of the battle the Troop had two guns in action on the road at the Sand Pit, and four on the heights to its right. The Troop was exposed to a hot fire, and three guns were temporarily disabled, and on the French cavalry taking this part of the plateau several gunners were sabred ere they could take refuge in the infantry squares. On the French capturing La Haye Sainte, towards 6 p.m., the forward position of the troop became untenable, and it was ordered to take ground to the right. It was in the position shown on Diagram I., when the French Imperial Guard made their desperate effort against the main position, and on these veterans recoiling, and the French battle front generally giving way, the three (still mobile) guns joined at once in the pursuit and moved to the heights beyond La Belle Alliance.

Major G. Bean's Troop, R.H.A.
(armament—Light 6-pounders).

This troop was in action on the ridge, considerably to the right of the road leading to La Belle Alliance. At the time of the advance of the Imperial Guard the troop was under the command of Lieut. Maunsell, and was placed immediately in front of the assaulting columns, on which it continually fired until our own infantry charged the French. The troop then advanced to the spot where the Duke of Wellington and his staff were posted, but did not immediately come into action, after a slight delay it took ground to the left, and advancing took up a position on the right of the road. A friendly battalion for a time masking the retreating French columns, and prevented the guns from firing on them. By the time the battalion uncovered the front the French were over the rising ground in the Troop's front, and were out of view.

Major Bean was killed in the action; both the 2nd Captains, and two of the Subalterns of the Troop were wounded.

ROYAL ARTILLERY.

Captain Sandham's Field Brigade, R.A.
(armament—9-pounders).

This battery was in action, as shown on Diagram I., and its fire

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was principally directed on the masses of the enemy's troops who were posted on the rising ground to the right, and in rear, of Hougoumont. The guns remained in action in this position practically during the whole continuance of the battle; near the termination of the action they received a fierce charge from a column of French Cuirassiers, when some of the guns (according to Colonel S. Ayde's account) in the general confusion retired to the Brussels—Nivelles road. Afterwards they resumed their original positions.

Captain Sandham's Brigade (or battery) is generally credited with firing the first shot from the allied position, at 11.35 a.m. on June 18. During the day no less than 1,100 rounds were fired by this battery.

Captain S. Bolton's Field Brigade, R.A.
(armament—four 9-pounders, and two howitzers).

This battery formed part of Sir H. Clinton's Division. At the commencement of the battle, the battery was in action some 700 yards away from Hougoumont. Three guns were temporarily detached to destroy a French battery of six guns which was causing heavy casualties among our troops in and near Hougoumont. This they succeeded in doing in about an hour, and then rejoined. The battery remained as stated until towards 3 p.m., when it was moved into action on the right of the Foot Guards. Captain Bolton was killed by a cannon-shot, shortly before the attack of the Imperial Guard. The battery received the French attacking columns with a hot fire of canister (commencing at a range of 200 yards), and materially aided the British infantry in repulsing them. The Imperial Guard yielded ground after being subjected to some ten minutes of this fire, finally at point-blank range (40 yards to 50 yards). After they had gone to the right about, the general advance was ordered by the Duke of Wellington, and in a moment friend and foe became so inextricably mixed as to put an end to all further firing by the battery for the day.

Only five pieces were in action in the last position. The howitzer of the left Division of the battery had been loaded by mistake with canister, and no opportunity for discharging it occurring, a N.C.O. was (when the battery was moving into its final position), ordered to take it aside and unload it, and to rejoin immediately. He failed to come into line with it however before the battle ceased. Thus in the last position there were present only the four 9-pounders, and a howitzer on their right.

At the close of the action, a shrapnel bursting prematurely in one of the guns wounded Lieut. Napier, of the Battery, in several places. The Battery bivouacked in its last position, and remained there all night.

Major W. J. Lloyd's Field Brigade, R.A.
(armament—9-pounders).

At day break on June 16, the 3rd Division, with Major Lloyd's Battery (and Major Cleeve's K.G.L. Battery) moved first to Nivelles; and between noon and 1 p.m. the force was ordered forward to Quatre Bras, where the action had already commenced. The battery came

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into action in a field in front of Quatre Bras, here it suffered severely from the fire of two Brigades of French Artillery (at a range of from 400—500 yards). In fact it lost so heavily that two of its guns became immobile until the end of the action, owing to the number of horses killed. Major Lloyd's battery succeeded in silencing the French guns, and forced back a mass of French infantry. The night after the action was spent in re-fitting; this finished, the battery retreated with the force to the Mont S. Jean position on June 17. In the evening the battery came into action close to the Brussels road and shelled the French infantry around La Belle Alliance, who were pressing too close on Wellington's heels, for about half-an-hour. Here the battery bivouacked during the night preceding Waterloo. On the morning of June 18 the battery came into action on the crest of the slope in front of its own (3rd) division, a little to the left of Hougoumont. Here it remained in action during the whole continuance of the battle. It was opposed all day by the French artillery, and was repeatedly charged (some six or seven times) by the Polish Lancers and Cuirassiers. The charges were received with canister. Some of the Cuirassiers after every charge were left among the guns—killed.

At 7 p.m. when the Imperial Guard advanced, the guns of the battery were still in line, and fired heavily on the advancing masses. Major Lloyd was killed at this time by an officer of the Imperial Guard.

Never during the entire action did the battery return the heavy fire kept up on it by the French guns. During the battle of June 18, every gun and every carriage were struck in many places.

Captain & Brevet Major T. Roger's Field Brigade, R.A.
(Armament—9-Pounders).

This battery was the only other British battery actually engaged at Quatre Bras on June 16. Early in the action it became involved with the French artillery (and was also subjected to musketry fire) and sustained several casualties. The range to the French guns was some 500—600 yards. The heavy cavalry (Kellermann) at one time threatened the battery, but it did not actually charge home. Later in the action the battery opened on a French column, using spherical case shot. The battery retreated with the rest of Wellington's army on June 17 to the Mont St. Jean position. On June 18, the battery had three principal positions:—

First.—Close in front of its own division (5th), behind the hedge of the lane which runs to the east of the Brussels road: This is where Sir Thomas Picton met his death close to one of the guns of this battery. In this position a gun was spiked, during D'Erlon's attack, by its N.C.O. This gun was sent to the rear to have its spike drilled out, the other five guns, however, kept together during the action, and did not become separated until the final advance occurred after 8 p.m.

D'Erlon's attack was met by gun and musketry fire, and on the French closing, the fighting fifth division moved forward between the guns of Captain Roger's battery, and met the attackers with the bayonet; whilst the smoke hung thick around the combatants the English heavy cavalry delivered their historic charge, and swept D'Erlon back with fearful loss.

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Directly afterwards the battery took up its *second* position; it moved to re-inforce the artillery on its right, on the other side of the Brussels road, and was engaged here some time. *Finally* the battery was ordered to take ground considerably to its right, and came into action on the left of Adams' Infantry Brigade. Here it opposed by fire the advance of the Imperial Guard, the guns of the battery (5), and the musketry fire of Adams' brigade taking this advance in flank.

On the general advance taking place, the battery limbered up and joined in the pursuit. Owing to the heavy ground, and the exhaustion of the teams, the rear guns could not keep up with the head of the column; two guns however, accompanied the advancing allied cavalry, and came into action several times against the retreating, and now entirely disorganized, French troops.

On the actual pursuit being taken over by the Prussians, as arranged between Wellington and Blücher, the battery in common with the Anglo-Dutch troops halted, and bivouacked a little way beyond La Belle Alliance.

Captain J. Sinclair's Field Brigade, R.A.

(Armament—Five 9-pounders, and one 5½-inch howitzer).

When the action opened this battery was posted near a wind-mill on the left of the Brussels road, and in rear of the village of Mt. S. Jean.

On being ordered into action, it moved up the Nivelles road, and unlimbered on the right rear of La Haye Sainte.

The smoke hung in thick clouds in front of the battery's position, entirely blocking out the view. Consequently the battery directed its fire over the dead bodies of some horses which lay immediately in front of it. (A novel and practical form of indirect laying with a smoke obscured target).

Towards 3 p.m., as a result of a heavy and continuous fire being kept up, ammunition ran low, and the battery was charged by some French Cuirassiers. These were met by a counter charge from the 1st (Royal) Dragoons, and driven back. The battery then retired behind the squares which were in rear of it. The left gun (without its limber) being surrounded by the enemy's cavalry was not, however, withdrawn. Ammunition being duly replenished the battery once more came into action in the same position and recovered its gun. Captain Sinclair was now ordered to move to the right, near Hougoumont. At this moment the heavy French assaulting columns could be seen advancing against the Allied right.

The battery remained in this new position until midday on the 19th. The ground where they were now in action was encumbered with the killed and wounded of the Imperial Guard.

The ground was very heavy to move over, for we read that in advancing to take up its first position the gun wheels sank in up to their naves.

CONCLUDING REMARKS.

Having briefly recorded the principal services of the various (British) Horse Artillery Troops and Field Brigades at Waterloo, we may in conclusion note a few points of general interest with regard to the battle.

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It will have been noticed that Captain Mercer's troop was the only one which kept its actual position, and whose detachments remained with the guns throughout the stress caused by the two great French cavalry attacks, first by the veteran horsemen (some 5,000) of Milhaud, secondly by Kellermann's 9,000 sabres—the latter was delivered when Milhaud had failed to achieve anything decisive. Each attack was led by Marshal Ney, Prince de la Moskowa, in person. It is only to be wondered at that having captured the allied guns, no injury was done to them. Many courses were open. Spare teams might have followed in the wake of the attacking horsemen and dragged the captured cannon back to the French lines. The guns might have been thrown down into the hollow way, the sponge staves even might have been broken, or the sponges complete carried off. Or the guns might have been spiked at least, with the pistol ramrods carried by the cavalry. For the magnificent feat of arms of the French cavalry was wasted, and on each advance the re-manned guns, holding up their fire to the last blew the leading squadrons to pieces, and the gunners promptly retiring under cover, and the guns being neglected, nothing of permanent benefit was achieved.

One is very chary of criticising these war-worn veterans of the the Emperor's last, and perhaps almost finest Grand Army, (at any rate since 1807). For of experience in civilised warfare they possessed far more than any soldiers of the present day. That they failed to reap the benefits that were to be gained from their truly heroic efforts, shows how difficult it is to keep one's head on the battlefield, when in close contact with the enemy, and to recognise, and make the most of, any instant opportunity that offers. Perhaps some will say that Marshal Ney might well have seen to the destruction of the Allied artillery directly it fell into his hands. Alas! *le brave des braves* would forget on a battlefield any troops even that were not actually under his immediate notice; witness his request at this time for reinforcement by the Emperor, and meanwhile one of his own divisions was actually standing at ease close to Hougoumont, merely awaiting his orders to second his efforts! No, it is more astonishing that Kellermann, who had shown on previous battlefields, and particularly at Marengo in 1800, how well he could keep his head, did nothing in the matter. Doubtless he looked for the initiative to spring from Marshal Ney. But we must not forget that Marshal Ney took the field at the commencement of this short campaign with a full appreciation of the fact ever before his mind, that he was hopelessly compromised with the Bourbons; and there must have been always before his eyes the vision of the certainty of a traitor's death in the event of defeat. Such a thought might well nerve him to acts of desperate courage, and who will gainsay that in 1815 Ney fairly outshone all his previous efforts in this direction. But such an ever-present idea would not strengthen his judgment, and thus some allowance for his shortcomings in this campaign must be made.

Be that as it may, nothing, fortunately for us was done, and the guns were regained intact by our gunners when the French cavalry on each occasion, having failed to achieve anything decisive, surrendered the plateau.

Owing to the incessant fire they kept up during the battle of

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Waterloo, many of our guns became unserviceable.

The total ammunition expended by our batteries on June 18 was nearly 10,000 rounds.

The damage suffered during the battle was so quickly repaired that Sir George Wood was able to take every gun with him, when the advance on Paris was commenced, that had been in action on the field, in addition to four extra 18-pounders.

Return of killed, wounded, and missing, in the British Artillery at Waterloo.

	Killed.	Wounded and Missing.	Total.	Grand Total.
Officers	5	24	29	303
Other ranks.	53	221	274	
Horses	337	158	495	

Total British artillery engaged:— 2,967 all ranks.

Two field brigades in the vicinity of Mont. St. Jean, but which were not brought up in time to participate in the great battle, were:—

Captain J. Brome's Brigade, 3rd Battalion, R.A.; afterwards 2nd Battery, 13th Brigade, (1860); now No. 65 Coy., R.G.A., and

Major G. W. Unett's Brigade, 3rd Battalion, R.A.; afterwards 3rd Battery, 7th Brigade, (1859); now No. 66 Coy., R.G.A.

Both of these brigades received the boon service granted for Waterloo, which included, among Waterloo men, all troops which had on June 18 been employed in the village of Waterloo, or those detailed to the right to prevent the enemy's advance on Brussels through Hal.

At this period we find each gun and howitzer is drawn by teams of six horses each, and each wagon was drawn by a six-horsed team. Captain Mercer also tells us that the limber-boxes of the period contained 50 rounds of gun ammunition.

With reference to the number of guns present on both sides in the action, we find that the Anglo-Dutch Army brought into action 156 guns as compared with a total of 67,000 men, which gives barely 2½ guns to every thousand men. Whereas Buonaparte arrayed 74,000 men and 246 guns for the assault of Wellington's position on the plateau of Mont. St. Jean, this gives nearly 3½ guns to every thousand men, and is undoubtedly a better proportion. But we must remember what Professor Oman says in this connection, "The English "Armies unlike the French always took with them a comparatively small proportion of artillery. But what there was was excellent, "from its high discipline and the accuracy of its fire. The Duke "preferred to work with small and movable units, placed in well-"chosen spots, rather than with the enormous lines of guns that "Buonaparte believed in." But Napoleon commenced his career as an artillery officer, and was ever mindful of this fact; and there is no doubt that he attached enormous importance to concentrating the fire of a large number of guns on the point selected for attack, to blow a hole at this spot with artillery fire, and thus to open the way for his infantry columns to the decisive point.

The numbers of guns and their proportion in the two armies

[1] NOTE.—Major Lloyd's and Major Rogers' brigades, R.A. had been engaged on June 16 at Quatre Bras. Their total losses on that day were 26 killed and wounded.

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is quite in accord with Professor Oman's conclusion (as stated above), albeit he was writing about the Peninsular War.

(With reference to the Prussian Artillery, Siborne gives the number of guns present on the side of our allies in the great battle as 64 guns by 4.30 p.m. on June 18; and towards 7.30 p.m., nearing the crisis of the battle, the number had increased to 104).

There is another point also to notice. Sir Augustus Frazer, (Commanding the R.H.A. at Waterloo), prevailed on the Duke of Wellington to substitute in some of the Horse Artillery Troops, heavier guns, 9-pounders, and also some howitzers, in the place of some of the lighter guns, 6-pounders, with which the R.H.A. were then armed. This was done because the French were known to use 12-pounders as well as 8-pounders in the field. To this fortunate occurrence, at the very last moment, too much importance must not be attached. But it undoubtedly assisted the Horse Artillery Troops by giving them a weapon more nearly the equivalent of that in the French hands, and prevented them being over-matched through sheer weight of metal. Lack of confidence in one's weapon is apt to beget over-caution in handling it, as the Russo-Japanese War, 1904-5, has lately exemplified.

Further it is well known that the cry of war is always for increased gun power; whilst that of peace is for increased mobility. It is true that England had only just emerged from the long and trying struggle in the Iberian Peninsula, and, therefore, it may be considered that gun power might have been more fully appreciated than it was, when war broke out in 1815. It is only fair to say, however, that the country and roads in Spain and Portugal were totally unsuited to heavier weapons, or to the handling of a large quantity of guns, and under these abnormal circumstances light guns in the Peninsular War had naturally enough been tolerated. It is a fair conclusion that had the terrain in the Peninsula been suitable for the employment of heavier pieces, the demand for their introduction would have been made years before. As it was, directly our troops took the field in one of the recognised cock-pits of Europe, the change was at once demanded.

The proud motto of "Ubique" stands for much, but the representatives of the Royal Regiment who were present on the plateau of Mont. St. Jean undoubtedly contributed their quota to it. Their ordeal was assuredly no light one; for to stand in battle array against the Emperor's choicest troops, and to be the target for the tremendous bombardment that invariably preceded his great attacks, was a trial that would test the endurance of the most seasoned soldiers in Europe. That the discipline in the Regiment at that time was high is proved by the fortitude and fine conduct of Captain Mercer's troop, and also by the conduct of the *personnel* of all the other troops and field brigades. For although they took refuge in the squares (acting strictly in accordance with the Duke's positive orders in so doing), yet on their guns being once more released they quickly emerged to re-man them again. And the way the guns were handled, and fire invariably directed on that target which was of paramount tactical interest at the moment is a teaching example from the close study of which great profit must accrue.

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The Artillery under the provisions of The Territorial and Reserve Forces Bill, 1907.

By COLONEL H. C. C. D. SIMPSON, C.M.G., R.A.

THE passing into law of the Territorial and Reserve Forces Bill, 1907, authorizes the carrying out of probably a more radical scheme of re-organization of our land forces than has ever been attempted by any previous Minister for War in this country. It seems, therefore, fitting that some notice should be taken of it in the pages of this Journal, so far as can be gathered at present, its measures will affect our regular and auxiliary artillery.

In the former, our field artillery of the home establishment is about to receive some very drastic treatment. Of the thirty-three brigades, ⅔ are allotted to the expeditionary force, and ⅓ are about to be converted to what are to be termed training brigades with eventually a considerably reduced establishment of regular officers and men. The duties of these latter brigades I will deal with later on. This branch is also to be supplemented by the conversion to field artillery, of some twenty-nine garrison artillery militia regiments, whose duty in war will be mainly to provide the ammunition columns for the divisions of the expeditionary force. When the latter are sufficiently trained as to be considered fit to take up these duties, the regular field artillery, home establishment, will be considerably reduced. The horse artillery will be scarcely affected by the new scheme. It has been rightly considered unwise to make any material alteration in this branch, the members of which must, to be efficient, receive a continuous regular training, and embody in their establishment some reserve, to meet unforeseen emergencies. Thus of the fourteen service batteries only six are required for the expeditionary force, leaving eight, which, with the two batteries of the Hon. Artillery Company, more than suffice for the requirements of the territorial mounted brigades, whose rôle will presumably be solely for reconnaissance purposes and not for shock action.[1] If any guns are required at all, one section would appear to be likely to meet the circumstances of each brigade of the fourteen to be formed.

The small peace establishment of heavy and siege artillery also remains unaffected by the scheme. But as regards mountain artillery,

[1] In the Swiss Cavalry the usual rôle of Horse Artillery is assumed by mounted machine gun companies, which require less training than the former.

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bearing in mind the proposed new rôle of this arm, and the necessity of a reserve for India, circumstances may compel the re-creation of a small force of this branch at home.

From causes absolutely apart from the provisions of this Bill, the coast defence artillery has been reduced by eight regular and about the same number of local companies, as also in a very large percentage of each company establishment. Bearing in mind that the fortress artillery must constitute a reserve in war for increased units for our heavy, siege, and mountian artillery, any further reduction is probably as unlikely as in the case of the horse artillery.

With the exception of horse and siege artillery, the former being solely allotted to mounted brigades, and the latter held unallotted as a reserve to meet certain eventualities, the whole of the regular mobile artillery is in future to be divisional, under the command in each case of a Brigadier.

But the most interesting developments of the Bill are possibly those affecting the Volunteer artillery, which are doubtless receiving the close attention of the Army Council at the present moment. The following suggestions are merely prompted by experience gained from service with the auxiliary mobile artillery, and from witnessing the field operations of a somewhat similarly organized artillery,—that of Switzerland.

The rôle of the territorial artillery would appear to be:—

1. To assist our regular garrison artillery units in manning the fixed and movable armaments of our coast defences.

2. To constitute the artillery required to co-operate with the fourteen territorial divisions in repelling raids on the United Kingdom.

3. After the first six months of a national war, to be willing as individuals to reinforce the corresponding units of the artillery of the expeditionary force.

As regards (1) certain changes in the present system have to be noted. For example in Ireland, owing to the non-existence of territorial forces, three garrison artillery militia regiments are to be retained for service in the fortresses. But the remaining units required to supplement the regular coast artillery in the fortresses will be formed entirely by territorial coast defence artillery located in the neighbourhood of the fortresses. The companies allotted to fixed armament will be under the orders of the respective coast commanders in peace as well as war. But those intended to man the land front (movable) armament, will be in peace under the territorial divisional artillery commander for general purposes of training, although occasionally lent to the coast defence commander in order to learn their rôle in the local scheme of defence.

The precise organization of the artillery referred to in (2) has not, if decided upon, been publicly announced at the moment of writing this paper.[1]

What would appear to be a desirable establishment? It must, I imagine, be affected to a large extent, by the following conditions of tactics and convenience.

[1] 15th August, 1907.

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1. That, owing to the close nature of this country, the deployment of as large a force of mobile artillery as would be employed in Continental operations is practically impossible in all circumstances, and at any rate unnecessary, especially bearing in mind the comparatively limited amount of artillery and ammunition supply likely to accompany any raiding force.

2. That a portion of the artillery included in the divisional artillery will be required to man the land fronts of our fortresses, and so need not be possessed of as many very rapid-moving batteries as would ordinarily be the case.

3. That the difficulty of instilling into a body of men with such limited time at its disposal, a thorough knowledge of, and efficiency in, the duties of light Q.F. field artillery, must make it desirable that the number of light Q.F. units should be fixed at as low a minimum as practicable.

4. That the difficulty even in regular batteries, of, under certain circumstances, effectively conducting and controlling the fire of six Q.F. guns in one battery, and local Volunteer conditions, make it advisable to limit the number of guns in a battery to four, heavy or light.

5. A consideration of the armament likely to be available for the equipment of the divisional territorial artillery. This we may assume as consisting of 15 Pr. converted Q.F. guns, some 5″ field howitzers (when the regular field howitzer batteries are re-armed), 4·7″ Q.F. guns, and a few mountain pieces, and medium siege howitzers. The proportion of guns to infantry varies in different armies and under different circumstances of war. Thus, for the divisions of our expeditionary force, the nature and number of guns in a division are as follows:— 54 field guns, 12 field howitzers, and 4 heavy guns—total 70 pieces. A division of the Indian Army mobilized for war includes in its artillery:— 18 field guns. 12 mountain guns, and 4 heavy guns; that is, 36 less field guns, and with mountain guns taking the place of the field howitzers of the divisions of the home army.

Bearing in mind the previous considerations, a satisfactory organization for the divisional artillery of the territorial army would appear to be a mean between the Indian and Home establishments, somewhat as follows:—

Twenty-four field guns organized in two brigades of three batteries of four guns, with ammunition columns, twenty-four heavy guns similarly organized, and eight field howitzers in one brigade of two batteries of four howitzers, with ammunition column. In two of the fourteen divisions, namely those formed in the Highlands of Scotland and Welsh Border grouped regimental districts respectively, the eight field howitzers should be replaced by three batteries of twelve mountain pieces. The total number of guns in a division would thus amount to 56-60. With ammunition stored at numerous handy centres in the country, it seems doubtful whether divisional ammunition columns would be required, or at any rate only to a very limited extent.

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In addition to divisional artillery proper, in our armies at Home and in India, there are held available for immediate mobilization for war, a certain small number of unallotted units of siege artillery for service with the field army under certain circumstances. In the home army they comprise a brigade of four batteries of 6″ howitzers, and a brigade of two batteries of 9·45″ or other nature of heavy howitzers. In India these unallotted units may be said to include one brigade of three batteries of 5″ field howitzers with ammunition column, and one brigade of two batteries of 6″ howitzers.

It must not be overlooked, moreover, that this latter piece forms part of the armament of the land fronts of our home fortresses, as well as the 5″ howitzer.

In our territorial artillery it would seem advisable to include in three of the divisions, those formed in the London, Home counties, and South Midland grouped regimental districts respectively, a brigade of three batteries of 6″ howitzers, in lieu of the same number of 4·7″ guns.

The present nucleus of this future divisional artillery lies in the Volunteer heavy artillery which is in a very fairly efficient condition. The administration, pay, clothing, equipment, and recruiting and horsing, of this artillery, will constitute the duty of County Associations, assisted by the guidance of the Army Council. Its training will be the sole responsibility of the divisional artillery commander, (a retired Brevet or Substantive Colonel of the regular artillery), himself under a Major General on the active list, commanding the territorial division.

Let us now consider the principles on which the field artillery of the special contingent (at present militia) and of the territorial divisions (at present volunteers) are to receive their training. To do this we must refer once more to the training brigades of regular field artillery, which are to constitute in future the source from which the river of all artillery instruction is to flow.[1] In order that knowledge may be practically at the doors of their pupils, they are to be located in convenient centres, Edinburgh and Glasgow for the Scottish artillery, Clonmel and Dundalk for the Irish artillery, Newport for the Welsh artillery, and Newcastle, Sheffield, Bradford, Leeds, Preston, Birmingham, Exeter, and Woolwich, for the English Corps. As artillery advisers to the G.O.C's-in-Chief, in each command, we have in the Eastern, Southern, and Irish commands, the regular artillery divisional Brigadiers, and in the Northern, Scottish and Western commands will be Colonels, R.A., to command the regular field artillery (including special contingent).

A Memorandum on the training of the territorial forces and special contingent has been recently issued. We learn as follows:—

A. The men of the special contingent will receive the following periods of training with the training brigades:—six months training on enlistment, an annual training of fifteen days, and before promotion to the ranks of Corporal and Serjeant a further short course.

[1] In this respect our Territorial Artillery is better off than that of the Swiss which has no regular Artillery on which to model itself.

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Gun practice will be carried out in four out of six years. Voluntary training in addition for all ranks will be available. All N.C.O's and promising recruit gunners should be trained as layers, and a certain selected number as range takers.

On mobilization the whole of the special contingent will be called out, and the men required to complete the expeditionary force will be forthwith posted to it, the training of the remainder going on continuously.

B. In the case of the territorial field artillery the training brigade will apparently act as a training centre. A proportion of the officers will first be trained by the training brigade, and the force will then be trained by its own officers in all respects. The Staff of the training brigade should co-operate to the full, but should not assume direct responsibility for command or training.

If it is found impossible to require all officers to attend courses as laid down, at the head-quarters of the training brigades, a sufficient staff, temporarily or permanently, must be detached from the training brigades for the purpose of giving instruction at the territorial centres, utilizing for the purpose, existing local accommodation, and drill-sheds, &c., as far as possible.

(In the case of the light field artillery, the difficulty will possibly be found to consist in recruiting sufficient drivers who will be able to afford time to acquire a sufficient knowledge of equitation and driving, as, to the majority of men fond of riding, the territorial cavalry may possibly afford greater attractions. Time can alone show how this part of the whole scheme will work. By means of the County Associations facilities should be given to the men for learning to drive in a team of hired draught horses trained to haulage in civil life. Even under the existing Volunteer arrangements the driving of some of the Volunteer batteries is very creditable, though due in most cases to the presence in their ranks of time-expired field artillery drivers).

The annual camp in the neighbourhood of the practice ground, will afford an opportunity for completing the individual training of the rank and file, under the immediate supervision of the divisional artillery commander, who may possibly receive some assistance from the Staff of the training brigades.

When the stage of training of the unit is advanced enough to allow of profit being derived from exercises in combined operations with other arms, arrangements should be made for conducting the same.

Those units of the divisional artillery which are allotted to land front defence should be placed periodically under the coast defence commander to whom they are allotted, for the purpose of being specially trained in the duties which they will be required to undertake on the outbreak of war.

Very useful instructions are also given in the training pamphlet,[1]

[1] Although not so stated, it would appear for many reasons desirable that the Territorial Artillery should be represented on the Staff of the "D.G. Territorial Forces" as also in the Department of the "Inspector General of the Forces," by regular officers (who have served on the Regimental Staff of the Volunteer Artillery).

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unnecessary to refer to here, with reference to duties on embodiment. As regards the mountain batteries, in the absence of any regular mountain artillery in this country, it would seem desirable that a small establishment of mules—eight per Côrps—should be maintained permanently in charge of four old mountain gunners, under the Adjutant at the head-quarters of the Côrps concerned.

The three siege artillery brigades should carry out their annual training camp at Lydd, as often as possible.

As regards coast defence artillery it is officially laid down that this branch must be fit for service on mobilization. The existing regulations which deal with the training of the Volunteer artillery allotted to coast defences require but little modification, and may be accepted as a general guidance for the territorial coast defence artillery.

By the transfer of practically the whole of the militia, and a large portion (⅔) of the Volunteer artillery, to divisional artillery, presumably a few of the Lieut.-Colonels, M. & V.A., will be reduced, and the future Adjutants and Permanent Staffs of the territorial field artillery will be largely furnished from the field artillery branch of the Regiment.

Such would appear to be the chief modifications in the regular and auxiliary artillery created by the carrying out of the provisions of this important Bill. There are also other changes to note in artillery commands, &c., in India, under the re-organization of the forces there. The I.G.R.A., and one of the three Brigadiers, R.A., have been abolished, and an Inspector of "Coast Defences and R.G.A." substituted. There has been a large increase of ammunition columns, and it is understood two Native mountain batteries are to be shortly added to the establishments of the army in that country.

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A Senior Officers' Course at Hythe.

By COLONEL A. J. ABDY, R.A.

THE most pressing need of the present day is an improvement in the knowledge of each other's duties and movements possessed by all ranks of artillery and infantry. The General Staff is fully alive to the importance of increasing this knowledge, and the various Commanders-in-Chief do all they can in the same direction, but when the time comes for an officer of one arm to be attached for a period to the other arm, it is found that he can hardly be spared from his own important regimental duties.

In all branches of the service the work of the furlough and non-training seasons is much the same and little value would be gained by an interchange of officers then.

Every week of the train. g season is carefully allotted for a progressive system of training at which every officer should be present with his unit.

Unless a regimental officer be attached to another branch for a whole season it is hard to see how much progress can be made in his instruction in the line desired. With Staff Officers this is different, and their absence for ten days or a fortnight can be arranged in almost all seasons but that of the manœuvres. Accordingly the Commandant of the School of Musketry, Hythe, has instituted three Senior Officers' Courses each summer. The officers composing them consist of Generals of Divisions, Brigadiers, Coast Defence Commanders, Commanders of Districts in India and the Colonies, Staff Officers of all ranks and grades, and a very few senior regimental officers, but it is hoped that more of the last named, especially commanding officers may be able to come in future.

Through the kindness of the Commandant and with permission from the War Office I attended the second of these courses in 1907. I am convinced that it would be greatly to the advantage of the service if a large number of officers of the Royal Artillery could attend these or similar courses.

Most artillerymen have seen a course of infantry and cavalry officers present in camp when their brigade has been carrying out its annual practice; they will remember how the officers of the other arms have to see as much as they can at a respectable distance from the firing point, under the guidance of someone specially told off to them, who, however, is not one of the important Staff Officers of the camp. Much as all artillery officers wish to help their brothers in arms in acquiring knowledge of guns and gunnery, it is impossible for the Staff Officers of a practice camp to attend to anyone but the brigades practising. At the most the instructor of gunnery may spare half an hour each morning to a short lecture on the practice about to take place, with hurried comments on that of the previous day. The greater portion of information gained by officers of other branches

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must, of necessity, be by means of conversation with officers of the batteries not firing while watching practice each day. Much of value may be learned this way, but the method does not compare favourably with that in which the Senior Officers' Course is conducted at Hythe.

As soon as an officer is detailed for such a course he receives from the Adjutant, School of Musketry, a paper to fill in with particulars as to his requirements for quarters and messing and an offer to send a list of lodgings should he prefer not to live in mess. Bed linen and towels necessary to make quarters in barracks habitable can be hired at rates comparing most favourably with those charged at Okehampton, Salisbury or Trawsfynydd. The servants, range orderlies, and others employed at the School of Musketry are time-expired men paid by Government, and as far as my memory goes, of a far superior class to the servants as provided by the R.A. Regimental District Staff in former days. The mess and messing are both admirable; the best I have ever seen in a place where the numbers of those in mess fluctuate from week to week.

The scheme of work consists generally of:—

Forenoon. { *(a)* Half an hour's lecture in the lecture hall,
(b) series of demonstrations on the ranges or on the neighbouring hillsides of aiming, judging distance, or rifle fire.

Afternoon { *(c)* Half an hour's lecture,
(d) series of demonstrations as in the forenoon.

Work proceeds daily, but is suspended on Saturday afternoon.

As there is no other course under instruction at the same time as the Senior Officers', a company from one of the battalions at Shorncliffe is sent to Hythe on detachment for purposes of illustration and demonstration rifle fire on the ranges.

The lectures in the hall are given by the Commandant, Chief Instructor, Experimental Officer, or one of the Instructors, the greater number by the Chief Instructor.

Each demonstration on the ranges is carried out under the superintendence of one of the instructors who gives a clear account on the ground of what is about to be done.

In the lectures, care is taken to avoid any repetition from the Training Manuals, but the explanations and amplifications of these works are most fully gone into. Among the subjects treated in the "Hall" lectures are "Fire direction, control and discipline," "Improvement of eyesight and judging distance," "Range practices," "Field practices," "Organization of fire," and "Musketry training"; the title of the last mentioned subject may seem rather vague, but it should be of the greatest value to a General or Staff Officer as it draws attention to points overlooked in the regimental training of recruits and soldiers, and to matters connected with the care of, and work with machine guns.

The lectures connected with *matériel* include those on "Foreign rifles," "Care of arms," "Machine guns," "Thirty yards range," "Preparation of ground for field practices," and "Telephones."

As every minute of the time available for the course was fully occupied it would be impossible in this paper to describe in detail any of the very interesting tests and demonstrations shown on the ranges, but a few words on some of them may be acceptable.

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I have, therefore, selected the four following, viz:—

"Judging distance and locating hidden men or figures," "Penetration of bullets," "Observation through mirrors," and "Rapid fire test," of which to give a very short and imperfect description, but sufficient I hope to show how useful an intimate knowledge of their subject matter would be to all artillerymen.

Judging distance and locating hidden men or figures; in this, men are taught to describe to others features or spots on the ground within their field of vision; in doing so they are taught to make use of the various simple aids, such as measurement by fingers' breadth from a salient mark with the arm stretched at full length and indication in terms of an imaginary clock face placed on such a mark. Fatigue men hidden at various spots pop up from under cover, fire a round of blank and disappear; the men of the squad have to discover whence the shot is fired, each man has to place the range as he estimates it on the sights of his rifle and lay it down without communicating his estimate to anyone. The men in turns have to describe the spot where they saw the fatigue man so that the rest of the squad can quickly discover it.

This system of use of the sights for indication of distance without communication to neighbours is very good, and is valuable for purposes of records, working out averages or tests of proficiency.

Great stress is laid on the necessity of all ranks being constantly exercised in judging distance and tests of eyesight; officers require just as much practice as N.C.O's and men. The difference in the mean percentage of error between officers and N.C.O's is so small as to be negligeable.

Penetration of bullets. A large variety of material was fired at, walls of brickwork 9 inches thick, one of good, another of bad construction; sandbags in headers and stretchers; elm, pitch-pine, oak and blue gum blocks in length and cross wise, and iron plates.

Without giving particulars of results it is sufficient to mention that the difference in effect on the brickwork between the fire of one of the School of Musketry staff sergeants and that of an infantry marksmen was very great, as the former placed shot after shot on the same spot, loosening the brick aimed at in three or four minutes. The superior penetration of the special pointed bullet is most marked.

Observation through mirrors of the advance within decisive range consists of one section of 24 men advancing by alternate rushes of squads over the zone from 600 to 400 yards from the enemy. The object of the practice is best described in the words of the School of Musketry orders:— "Combination of fire and "movement under heavy fire, in open ground. Mirrors are used to "enable men who are not firing to realise the value of brief exposure "in movement, and the necessity for snap shooting to meet brief "exposure. The mirrors are placed (in splinter proofs) near the "targets, in order that the value of sustained fire for neutralising "that of the enemy may be appreciated.

"Note. Cover is to be used only in the direct line of advance, front-"age is supposed to be strictly limited and sustained fire essential."

The recorded results of the practice showed that the time taken

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by the 24 firers to advance from the 600 yards to the 400 yards was 22 minutes, in which time they fired 787 rounds, making 15 hits, or one each on half of the 30 iron falling plates that formed the target. The official remarks were: "The fire was well sustained, but not "very accurate, the rushes were short and rapid and the firers should "have suffered little from aimed fire."

This is a scheme providing much cause for thought to an artilleryman who might wish to support the defence; the attackers are too near to the line of defence for him to fire over the heads of the latter; the rushes are so short that accurate laying is impossible; the time, more than 20 minutes, is long for a sustained rapid fire as regards both physique of the gunners and supply of ammunition; the need for the officer commanding the guns to be in close and constant communication with the officer commanding the section of the defence is paramount.

Rapid fire test is carried out under the following conditions:—The aiming point and sighting to be preserved throughout. Ten second class bullseye targets for each firer, fired at each for one minute. Distance, 500 yards. Position—prone. The firers were a staff sergeant of the School of Musketry and a selected man of the infantry company. The former fired 154, the latter 104 rounds. There was a head wind which caused barrel mirage to interfere with the staff sergeant's sights in the 3rd minute and the wood smoke and oil vapour to obscure the sights for both after the 5th minute; these interferences were much greater with the staff sergeant owing to the greater rapidity of his fire and consequent greater heat involved and their effect was plainly shown on the targets after the 5th minute, the infantryman in the latter half of the whole period going far to make up the ground he had lost in the first half. It would have been most interesting to see an exactly similar test fired with a fairly strong cross wind blowing. The physical effect on the men differed; in one case the left hand was slightly blistered, in the other the power of the left arm failed in the 7th minute and, probably as a result therefrom, the right shoulder was considerably bruised.

This test leads one's thoughts to the number of rounds a trained soldier may be capable of firing on the battle field, and the question of supply of ammunition in the field, and how far it is influenced by the introduction of magazine rifles.

Much information is given at the School on the subjects of foreign rifles, machine guns, care of arms, and preparation of ground for field practices.

In the course of the lectures, the various Staff Officers more than once acknowledged that they had learned some method or hint from the Royal Artillery. I feel sure that no officer of the Regiment can attend such a course as the Senior Officers' without bringing away a volume of valuable hints, and must recognize that while fully abreast of the times in matters of training and practice the Staff of the School of Musketry are far ahead of the army generally in matters of thought and research. Personally, I am most grateful to all at Hythe for a pleasant and instructive week.

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On the method of carrying out practice in a service company of Royal Garrison Artillery,

By MAJOR C. P. MARTEL, R.G.A.

FOR some years past one of the chief objects of the Officer Commanding a Company of Garrison Artillery has been to obtain a "1st class" at the annual Service Class Firing. He knew that to a great extent he would be judged by the results of this firing competition, for competition it was and still is, as far as I can see, although the method of computing figures of merit has been changed and all reference to "competition" has been avoided; as a result there must be a tendency for the whole training throughout the year to be carried out with a view to excelling in this one form of practice, without due consideration as to whether it represented in the best possible way the conditions of actual war, or gave the best training for service purposes.

A slight study of the instructions for "Practice Seawards," 1907-8, leads one to suppose that the introduction of "Battle Practice" as an additional exercise to those already carried out, is the first step towards correcting any such tendency. "Battle Practice" we are told is "to accustom all ranks to fire under conditions more closely resembling those of actual service than is possible during "class firing" and other forms of practice," this being so it is far and away the most important practice of the year; but will it be treated as such? Personally I feel that as long as service class firing stands on its present footing everything will be made subservient to it. In service class firing there are decimals to be gained as in an examination, and where companies, often jealous of one another, are lying side by side in a station throughout the year, they watch one another with eagle eyes all through the practice, and argument is rife as to whether this or that should be allowed, or whether one has had harder conditions than another, shewing plainly that competition is as keen as ever. The fact that all companies are not competing, to the same set of conditions, so to speak, makes no difference; it is quite true that it is now, in a way, a game of trying to beat bogie, but there still remains that ·7 figure of merit which every man is striving for, and also those "crossed guns," which when men have once obtained, they do not like taking off in front of their more fortunate comrades in the same station. I always understood that the present method of carrying out

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service class firing was introduced with the object of checking somewhat the spirit of "competition," I doubt if it has done so, but in some ways it has caused more embittered arguments because of the great difficulty under present rules for everyone to compete under equal conditions. Competitions after all have their advantages, but I think we should decide one way or the other, either have a *bonâ fide* competition, under as nearly as possible equal conditions for all, or do without them altogether.

It is undoubtedly difficult to carry out proper competitive firing under conditions which approach to those of war, to anything like the extent that one would wish, and, therefore, this nature of practice if continued, should be of far less importance than at present, and the summit of one's ambition should be, to excel in "battle practice" and the exercises laid down in connection therewith; these as a whole will give a far better idea of the state of training of the company than a few isolated tests for which men have been specially worked up all the year through, and can be introduced in the form of a competition if desired.

"Battle practice" is a term apparently copied from the navy, should we not, therefore, go a step further and make it our most important test of efficiency, adding some further competitive firing of a minor nature, which would correspond to the naval gun layer's firing, though not necessarily on identical lines? At present, it seems to me, that our service class firing is mapped out to fulfil three distinct purposes at the same time.

First. Test of details of drill and training.

For example, all the various methods of laying and range finding have to be fitted in to the various series, and practised irrespective of any tactical scheme, or whether they are the methods best suited to the occasion, this has no connection with service conditions and is done apparently to prevent one form of laying being selected and training devoted to it in preference to other methods.

There is a tendency at some stations to select the detachments from the company just before the firing, instead of employing the manning details, this again is not a service condition, though probably a check on over specialisation. In war time men would naturally be placed in the positions for which they were best suited; an objection might be raised that when casualties occur difficulties will arise, but a wise commanding officer can be trusted to give his men the best all round training he could, and would also know his best and second best man for every important post and give them extra training at the work.

On this subject of casualties I have heard many arguments, and the argument is usually turned to suit the occasion; at one moment, and to support some theory, casualties are admitted and we recognise them at service class firing, but as no spare numbers are allowed for replacing them it is equally easy to argue that casualties are evidently not expected in war.

It is difficult to imagine war in which no one is injured, although one might argue from the late Russo-Japanese war that coast artillery

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suffers very little in personnel, but it does not follow that this will always be the case, there may be more inducements for an attack on our less heavily armed stations and the enemy may have reason for risking his ships to a far greater extent than the Japanese Admiral considered advisable. But this is straying from the point. In addition to practising the various methods of laying and range finding as mentioned above, we attempt during service class firing to check the drill of each individual number on the gun, all at the same time that we are testing the battery command as a whole, the result can only be to give a very general idea of the standard of drill to which the company has attained.

Second. The general training of the company.

Looking at the "Instructions for Service Class Firing," it will be seen that in many ways it is a test as to how the training of the company has been carried out as a whole, and is framed to avoid to a great extent, over specialisation; now, however much this may be an advantage, it does not represent service conditions, and yet up to the present we have made service class firing our far most important practice, and are still keeping it on a pinnacle, at a point far above its real value. At all service class firing it is insisted that the full manning detail shall be present and the work properly manned, this is a test of the co-operation of all the various details included in the manning table, but I think a great deal more could, and should be made of this test, the whole exercise is of a nature too cut and dried beforehand, and there are so many things going on at the same time, and so much for the Umpire Staff to attend to in connection with the actual practice, that it would require a very much larger and more expert staff than ever I have seen to discriminate fairly between the training of one company and another. To appreciate refinements of this training, tests separate from service practice are necessary.

Why not judge of the drill, fire discipline, and training generally of a company by means of drill and some of the rounds allowed for elementary practice, adding a few more rounds to these if necessary as a special test for those points which would interfere with service conditions, and then reserve the majority of the rounds, at any rate of guns in the armament, for battle practice, making this the crucial test and judging by results obtained under, as nearly as possible, service conditions? If a classification must still be maintained, there should be no difficulty in formulating general rules which would enable marks to be given.

Third. War training.

Many attempts are made to introduce war conditions into the service class firing, but although some can be carried out in their entirety, others interfere with the details of the system as it at present exists.

Courses have to be made to fit in with conditions laid down in advance, sometimes this combined with safety conditions causes such limitations as to enable one to guess, as soon as the tug goes out, what the course is going to be.

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The necessity for keeping the time of a series accurately imposes many artificial conditions quite different from service, that is particularly the case with combined practice which also suffers from having to have two or three complete sets of umpires. The methods of laying and the variations laid down are already sufficiently numerous to make it difficult to fit in the various series and there is no scope left for any other combination which the fire commander may consider useful, or which the battery commander might have to employ in war without any previous notice, such for example as changing from auto sight to Case III., modified with the 9·2 Mark X. If a ship is going to come into auto sight range there is no apparent reason why she should not come to such a range as would enable her, with her numerous armament, to drive all the layers off the gun and necessitate the use of Case III. modified, this, therefore, appears to me quite as useful a change as Case II. to auto sights.

There are too many rules and regulations laid down which every company has to follow to enable the service conditions applicable to individual batteries to be carried out.

To give a B.C. six rounds per gun and to include a change of laying or range finding instrument in the middle of the series is not to my mind a service condition, nor does it show what results he would have produced on service. I do not think it is sound to argue that because the ranging is theoretically correct, therefore, the series fired after, must be good, but it seems to me that this is what we do to a great extent, due no doubt to our trying to make a little ammunition to go a long way, and to making the same practice test several things. I think it would be far better to fire the six rounds without any change of laying and to see practically that the last four rounds reflect the information gained by the first two. To my mind service class firing as at present carried out is purely and simply a "competition," and it would be far better to recognise this, and to conduct it under two headings:—

A. Drill and instructional practice.

B. Battle practice.

(A) would require hard and fast rules in the same way as any other examination with marks, no attempt being made to include service conditions, it would then become a practical test of the following.

1. Power of the layers to lay accurately.

2. Work of the detachments.—This would include rapidity and accuracy of movements, &c. (There are many important points which are slurred over now and pass unnoticed because it is impossible to test everything at the same time).

3. Fire discipline as far as concerned the combined action of B.C., G.G.C., B.C's staff, &c.

At first sight it would look as if this would require the whole of the ammunition allowed for the year, but this need not be so. Part of that now used for "elementary" could be worked in for examination purposes and this combined with a little of the present service

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class firing ammunition should suffice, this would still leave a good deal of 1-inch ammunition for training purposes and a considerable number of rounds for "battle practice." Drill could be employed for part of the tests, but undoubtedly each station would have to work out its own detail.

(B). Battle practice would then take its proper place as a test as to whether the previous training and practice had done the work which it was intended to do, viz: to work the officers and men up to that point of perfection which would enable them to carry out successfully the far more difficult exercises which would be set under this heading.

At stations where mobilization is carried out it is probable that the "battle practice" would take place during mobilization, but in any case it must be after the instructional firing.

As to bringing "battle practice" into the final classification, this I think is absolutely necessary considering its importance, but marks cannot be given in the same detailed way; still there should be no difficulty in a suitably chosen staff being able to decide such points as whether orders were properly carried out or whether the rate of fire was objectionably slow, or the general service of the guns slovenly, &c.; everything connected with good judgment displayed by the B.C., and accuracy of layers, range takers, &c., would come out in the results of the firing, so that a general decimal could easily be awarded, to add to that already obtained.

There is no doubt that it is easier to conform to service conditions when men are mobilized for a week or a fortnight and actually living in their works under service conditions, but even if they are not, it should be possible to keep men in the works from early morning till late in the evening for one day at a time without much trouble, and if everything has been put on a war footing in the fort the day before, and a guard left for the night, it would approach as nearly as possible to mobilization. For tests under service conditions men would be broken off and the usual look-outs, &c., posted, guns would be manned when considered necessary as in war time and the umpire staff would judge whether the time chosen was suitable or not.

Where there is practically open sea in front of the forts and a range usually free of shipping, it should be possible to carry out some interesting exercises at battle practice, though there are many of a "surprise" nature which could not be attempted on account of the danger to shipping.

It has always struck me that to properly represent an attack, the tug towing targets should go out during the night with sealed orders, which would be opened after the boat had left the shore, and that she should go out of sight, she would then come back in accordance with her orders, perhaps in the morning, perhaps in the afternoon, and it would be left, say, to the Fire Commander and others who had no knowledge of the orders, to engage as they would in reality; the tug would, of course, carry out some tactical scheme, the officer in charge running as well as he could on some course which would enable the guns to open fire; he should have some means of firing puffs or smoke balls to shew when he was engaging the forts. As soon as

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the tug got to within what he thought was 14,000 yards range the targets should be let out and the red flag put up, unless there was some obvious reason for not doing so. The fire commander should have a sealed envelope containing the names of the vessel represented by the target, this he should not be allowed to open until he had discovered the tug approaching. There should be no signalling between the tug and the shore, the range officers must do their best to give a suitable course or courses, if the fortress commander considers that the exercise is a failure and likely to lead to waste of ammunition he could always order "cease firing." Possibly a naval officer could be got to assist in formulating schemes for the launch and to go out in her as adviser to the range officer.

A danger officer would be required in each fort and he alone would decide whether firing could take place, the fire commander would give his orders to engage as on service, regardless of danger, but the B.C. would look to the danger officer for permission to fire.

If two or three tugs were available more elaborate schemes would be possible.

This may all seem very pointless, but I think we ought at times to get some practice under less stereotyped conditions than "go on course" "wind in" and the various other signals and orders that one knows so well and can guess almost the moment when each will be given.

If the fire commander does not know when the "enemy" is going to engage him, he will have to decide when he will open fire and give his orders accordingly. If the guns cannot actually be fired it is not his fault, he will have shewn what he meant to do. The order to engage will of course hold good and the B.C. will fire as soon as he is allowed to by the danger officer. The battery commander in his turn will have to select his method of laying and range finding, &c., he will not be tied down in any way, but will be judged by results. In making casualties the possible effect of the enemy's fire should be taken into consideration, they should not be made at any fixed rate such as one per detachment, but for some definite reason, imaginary of course. It would be quite reasonable to make casualties of all the numbers and the sights on one side of a 9·2 inch Mark X. gun, the umpires would then decide whether the service of the gun had been carried on as rapidly as possibly under the circumstances. As to time, no hard and fast rules can be laid down under service conditions, although, naturally, considerable stress would be laid on this point.

Objections might be raised in connection with the idea of running courses without the usual elaborate system of signalling from the shore.

At present, long range signalling, say at 12,000 or 14,000 yards is by no means perfect, and I am not sure that we would not do better without it. A little previous thought on the part of the range officer and those who manage the scheme should with a little practice enable good results to be attained.

It would be very difficult to fire when the tug was running straight on to the fort, so that the range officer when doing this should turn across occassionally for a short time, and indicate by some means

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that the target represented a ship end on and hits would be estimated accordingly.

I have always inclined to the view that the results of our peace practice with light Q.F. guns is no guide to the hits we would really obtain in war time. As a rule there are only one or two likely courses for service class firing from a battery, and the speed of target is usually known, consequently the necessary corrections can be marked out fairly well in advance, and there is no great difficulty in making hits. But a torpedo boat may not be so accommodating, and who can say in advance on what course she will approach, and what the travel correction will be. It is true that in some instances of narrow waterways she may have no choice, but this is not always the case. Suppose that the boat passes straight across the front at a range of about 1,500 yards and that the error of the day drum is graduated for 2,000 yards, then there is practically no travel correction, but the gun may require for various reasons a correction of + 30 on the water or + 50 on the drum; but now suppose that the boat approaches at an angle with a travel correction of − 30, then there would be no correction to put on the drum, and so on. Very different corrections are required in various cases, but who is to say in advance what correction will be required, or even what deflection, and how long will the G.G.C. have in which to make up his mind. I do not think these points are brought out by the present class firing, but I see no reason why they should not be at "battle practice." I suggest two methods, the first may only be possible by day, but the second could, I think, be done at night.

1. It is probably difficult to disguise a course if winding in is to be employed, but why should winding in be a necessity? Are there no circumstances under which a torpedo boat would go slow? Therefore, dispense with winding in for once and send out a tug, two if possible, with targets let out, and let them cruise round. At a certain time one gets into such a position that she can soon make safety, and the other so that she can run a course, this latter boat then runs up the red flag, this is a signal representing that a torpedo boat is within the beam; up to this time the detachments have been in exactly the same positions as they would have been in, at night, with look-outs, &c., the look-out now gives the alarm and the G.G.C. gives his orders; any correction or deflection should be allowed to be put on the guns before the tugs go out, but from that time to the "alarm" no alteration should be allowed. It is immaterial whether the target is moving or not when the flag goes up, what one wants is to train the G.G.C. to make up his mind quickly, as to corrections and deflections, and not give him half an hour to think it over. This should be good practice for changing objective during an attack, a feature mentioned at times, especially in "distribution of fire" orders.

2. Supposing that practice is to be carried out from two batteries A and B, send out a tug with a barrel target, and let the tug run as shewn by the arrow; drop the barrel at any range, and as soon as the tug is clear, which it would be in a few seconds, ring the alarm

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gong and give the G.G.C. 45 seconds in action, the detachments being kept in their ordinary night positions until the alarm goes; this would shew whether corrections can be put on quickly for *any* range. (This assumes that a gun correction is required). The range of the barrel might be anything between 2,500 and 900 yards, and with a drum graduated for 2,000 yards it is not likely that the same correction would be suitable for all ranges. Again, one gets very good practice by sending out the tug with several courses arranged for, one course running into another if possible, and to allow the G.G.C. to fire four rounds, from each of two guns, when-arranged as figure 2, one would fire when ever the alarm bell rings. For a course arranged as figure 2, one would fire when the target was at A, B, and C, and the G.G.C. would have to make up his mind fairly quickly as to corrections; if the tug is a powerful one it might be worth while to change speed during the run.

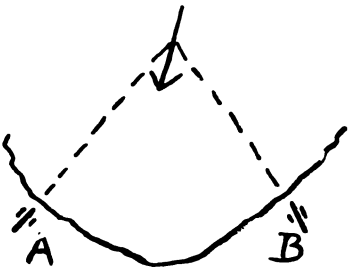

Fig. 1.

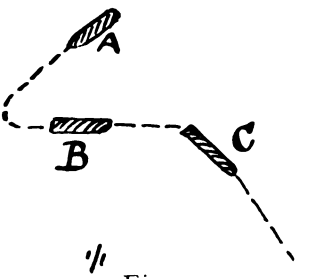

Fig. 2.

I have only given a very general outline of one or two possible schemes, as when one comes to detail, stations differ so much, that they must be worked out locally; it is likely that a scheme which is possible at one station will be impossible at another.

Considerable variation in the exercises would be necessary, otherwise in a short time officers would become quite accustomed to them, and they would cease to be, in any way, a test of the officers' powers to deal with the situation as it arose; but there is sufficient ingenuity among officers, if it is only brought out, to produce fresh developments when required.

In conclusion, the main points to which I have drawn attention are:—

1. That if a classification be maintained, the tests be carried out under two headings.

a. Drill, fire discipline, laying, &c., including some practice not under service conditions.

b. Practice under service conditions.

2. That as far as possible separate tests be carried out for separate subjects under *(a)*.

3. That the service conditions under *(b)* be more realistic than at present.

I have already explained these points fully and tried to shew how the end in view might be obtained. Many difficulties and objections can no doubt be pointed out, but if the main principle is sound, ways of overcoming them will soon be forthcoming.

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A reply to Colonel F. G. Stone's paper on "Choice of Positions for Artillery in the Field."

By MAJOR J. F. CADELL, R.A.

IN a paper on "Choice of Positions for Artillery in the Field," Colonel Stone has quoted from, and criticised, a paper of mine "Theories as to the best position for quick-firing shielded Field Artillery." The criticism is of the most kind and complimentary nature, but there are a few points which perhaps I may be allowed to urge in reply, especially since the paper criticised did not appear in this Journal and, therefore, cannot have been read by many of my brother officers, who have seen the criticism.

My paper was written originally for the R.A. Journal and some criticism on it being unfavourable, I withdrew the paper, re-wrote it and had it submitted to the Council of the R.U.S. Institution, by whom it was accepted. Naturally the paper was not written in exactly the same way for the R.U.S. Institution as it had been for the more technical readers of the "Journal of the Royal Artillery." The "R.U.S.I. Journal," does not as a rule produce illustrations in the text, and the topographical arguments, which depend rather too much upon the illustrations suffered somewhat from the reproduction.

But to return to Colonel Stone's criticism. To begin with my paper only pretended to theories. which were based upon three main points, the experiences of the Russo-Japanese War, topography, and ballistics of field guns. The experiences of the Russo-Japanese War were only gleaned from some rather sketchy books of war correspondents and the articles which had appeared before June, 1906, in the "Militär Wochenblatt," and other German and French Journals. I felt that if I wished my views to be published I was bound not to read the reports of the attachés, which are confidential, until after I had sent my article to the printers. I have since read these reports, but without really good contoured maps, it is very difficult to say, whether there is much or any ground to modify any of the statements made in my article, which be it remembered referred only to quick-firing shielded guns.

Solitary quotations of incidents where the Japanese used cover do not amount to very much, and it is very difficult to say the exact amount of cover they took. The Japanese regulations at the time of the war did not advocate covered positions and indirect laying. With the experience of the war and the dreadful havoc wrought by the Russians according to their own accounts from these covered positions, the Japanese when re-writing their regulations do not seem to have altered their opinion. The following is what is now said:— vide p. 203 "R.A. Journal."

362 "Laying will usually be direct unless the situation and "ground compel the occupation of an entirely covered position when "laying will be by the indirect method." The word "allow" is substituted for "compel" and "entirely" is cancelled. This alteration is, however, on no account to be taken to imply that indirect laying is recommended.

If nothing else had ever been written on the subject I should feel

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that this was a very strong argument in support of my theories. The Japanese must have known where they failed and also where their foes failed. The artillery fire from covered positions cannot have been to them so very dreadful.

I will here acknowledge that the chief cause of my writing the article on artillery positions was the desire to find a cause for the Russian defeats, knowing that they had a superior gun and after the earlier battles not an inferior number of guns. In searching for this cause a feeling of resentment was created against the Russian artillery officers who claimed to have found a safe way to victory, by fighting from covered positions. On careful analysis of the facts I came to the conclusion that whatever they had achieved they had not got victory Having gone so far I searched for the causes from the topographical and ballistical points of view, and came to the conclusion that they suffered disadvantages in every direction. I did not touch what is perhaps the most important side of the question, which is the moral, but this cannot be gauged except by results. During the war the Japanese cannot have felt that the Russians were gaining much tactically by the use of these covered positions for their field artillery. I will quote from Colonel Stone when explaining why the Japanese took less cover later in the war:— " and partly because the Russians showed more tendency towards concealment, necessitating bolder action on the part of the Japanese in order to find them, but chiefly because they learnt by experience that the Russian artillery fire was seldom very deadly." Surely if this points to anything, it points to the very small value of artillery fire from concealed positions in war, especially against troops on the move. We all know how well some of us can hit targets at practice camp from hidden positions, we know a dozen different accurate ways of working the switch; we can move the battery about so as not to hit the hill in front. The ways of doing this, described in the " Revue d'Artillerie," for February-March, 1907, would be cumbersome with a rapidly moving target, but we consider our simpler methods as good, but there are limits to what areas a gun in a covered position can attack, those areas will be of great value to an enemy. Still all these things are easy while our signallers and telephonists are of the best, when there are no half trained reservists to fill up the casualties, and when there are no hostile shell, very little noise and no danger. But in war we cannot be content to sit still unless we are determined to assume the passive defensive and be beaten. As I have shown the Japanese who have heard their enemy sing peons on the advantages of and the effect of artillery firing from hidden positions, and who have on occasions found their own artillery ineffectual in the support of infantry when thus sited, are now most emphatic that in future wars their artillery shall not imitate the tactics of the Russian artillery, but shall lay direct.

Further perusal of the most recent foreign literature has given me the impression that the Japanese concealment was of the nature of cover close to the crest or behind villages and woods from which command would be easy. The plans of the battles (not confidential) which I have studied very carefully, do not show Japanese batteries far from

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the crest, as they in several cases do those of the Russian artillery.

However, as I stated in my paper, the Russo-Japanese war was really no guide as to the handling of shielded artillery as the shield was certainly not generally in use. The one detailed account of the action of shielded guns which I have read I have been unable to again find in the original. The case is, however, referred to by Major C. de Castres de Tersac, and a translation of this appears in the Translations for September, 1907, on page 230, it runs as follows:—

"(2) Formerly, guns fought in the open, and consequently, " when a battery was attacked it was compelled to reply. Now with "facilities for concealment and indirect fire, it need no longer be so; " very often it is more advantageous not to. Even in the open their " shields enable guns to sustain attack without replying. During the " battle of the Sha Ho on October 12th, a Russian battery with no " other protection but the shields and the trenches hastily construct- " ed for the detachment," (this battery was on a forward slope), "sus- " tained for thirteen hours the fire of three Japanese batteries, which " did not prevent it from taking advantage of a lull to disperse two " infantry columns and cannonade a fourth battery coming into action. " The same thing occurred on the two following days. On the 14th " the same battery was exposed to oblique fire from artillery and " frontal fire at 1,400 yards from Japanese sharpshooters; yet during " the whole day it lost only six men wounded and one killed while "laying a gun. It should be added that the layer and handspike " numbers, emboldened by the security of their protection, remained " at their guns practically the whole time."

The shields of this battery, if I remember right, were extemporized shields provided by the commanding officer on his way to the front, certainly this seems to show that shielded artillery can remain in action exposed to hostile fire from a superior number of guns, without suffering any very serious loss.

As for the remainder of my arguments and deductions Colonel Stone appears on the whole to agree with me, but he seems to think that field artillery will be destroyed by heavy artillery.

It seems to be allowed by most authorities that heavy artillery in attacking field artillery will fire from hidden positions, this seems to be surely rather an excess of caution. In the first place these guns are some 6,000 to 8,000 yards away from their target, and presumably out of range of the field gun, while if the heavy artillery of the other side is equally distant they cannot reciprocally hurt each other except by accident. Heavy artillery may do great things in the next war, and like field artillery, their moral effect may make them an absolute necessity, but I have rather a feeling that they may hit less if too securely hidden. The heavy gun is most destructive when it does hit, but to range on a field battery even in the open on the crest of a hill at 6,000 yards is no easy business. A crest is a more indeterminate point than a trench, and apparently heavy artillery in the Russo-Japanese war was very seldom able to disturb the Russian trenches.

It is very easy to be courageous and blood thirsty at a writing table, in fact just as easy as it is to have no nerves when writing minutes for practice regulations, still there are some of us who may

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doubt if they will have the courage in the next war to sit on the crest of a hill taking all the risks and at the same time insist on their brother officers doing the same if they happen to be in command Every natural inclination in most men, will urge upon them the theory that they can obtain just as much fire effect from some place of safety behind a hill, but we believe and sincerely hope there are some who will make a bid for victory by fighting their guns from the crest, as only by doing so does it appear to many, when discussing the question more quietly, that we gunners shall be doing our best for our country and the honour of the army which we serve. We know, of course, that our artillery will suffer more, but the object is not avoidance of loss but the achievement of victory.

There are some field gunners who hope that should they be opposed by hostile heavy artillery, that it will carry out what by most authorities is considered the proper course and hide itself well; they have a feeling which may be mistaken that even with siege appliances of heavy artillery against them, that there will be less to fear from that arm if it is handicapped by the extra chances of error and the slowness of delivery due to those very deliberate tactics.

The German new regulations on this point of covered positions sit rather on the fence, but are now coming down on the side of cover, which might be expected at the moment of re-armament. They say "The difficulties connected with covered positions are outweighed by substantial advantages," but it is also explained that "covered positions are recommended on the understanding that they must be immediately left to take on advancing infantry, &c., if necessary." When infantry is advancing it may be supposed that every available gun will be employed in its support, this will not appear to many a good time to bring guns out from cover on to a new position in the open and begin ranging.

We may expect the Germans will have their turn at cover for a few years and that then the spirit of the attack will alter their views. It is to be noticed that they are now advocating the possibility of keeping some guns in reserve.

The advantages of the covered positions appear to be safety, power of movement and easy ammunition supply; its disadvantages, slowness in the change of target, the existence of much dead ground close to the battery and the want of moral support. The crest position has the advantages of certain effect in all directions, rapidity of action and moral support. The disadvantages are a comparatively easy target to the enemy, some difficulty in change of position, probably greater loss to personnel. Aerial observation will be a factor against the covered position which must very shortly be reckoned with if it became general, the covered position will then only have disadvantages. There may be much more urged for and against either, and arguments without end, but I feel sure that the only real criterion will be whether victory is obtained by the direct or indirect methods, and with the Russo-Japanese war as the last war experience of any value there is nothing yet to indicate that the use of covered positions means the achievement of victory. We get back to the omelette and eggs.

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OVERLAND TO JAPAN.

BY MAJOR & BT. LIEUT.-COL. R. W. BOGER, R.A.

HAVING journeyed to Japan in 1905 by way of Ceylon, Hong Kong and Shanghai, and having returned from the land of the Rising Sun in 1906 across the Pacific, and through the wild woods of the West to Chicago and New York, the writer considered that, on having to make the journey to the Far East in 1907, a trip through Russia and Siberia would be an interesting change of route.

These notes are written to assist others who may contemplate a similar journey.

In appendix A. will be found a table showing the days and exact times of arrival at certain specified spots on the line of route, it will be noticed that these times do not differ greatly from those scheduled in the "Traveller," issued by the International Sleeping Car Company, of 20, Cockspur Street.

The journey from London to Tokio will be considered under three headings.

1. London to Moscow.
2. Moscow to Vladivostok.
3. Vladivostok to Tokio.

From London to Moscow the two best routes are:—

a. Through St. Petersburg by way of the Kiel Canal.
b. By rail direct through Calais and Berlin.

The sea route has the advantage of being more economical but takes rather longer than the journey by land. Full information can be obtained from the United Shipping Company, 108, Fenchurch Street, (telegraphic address, "Neutral" London; telephone 22 Avenue).

It should be noted that the steamers of 2,500 tons, leave the Millwall Docks every Friday evening, and take about five days on the trip.

The single first class fare costs £6/6/- including victualling. £3 extra will be well expended in taking the *cabin de luxe*, for two persons the charge is only £4.

This route is recommended when time is no particular object, or when much luggage has to be taken.

The first steamer usually sails early in May in each year.

Passports *visé'd* by the Russian consul are absolutely necessary for all passengers travelling to Russia.

These can be obtained on application by giving four days notice, cost including *visé*, 10/-.

The journey from St. Petersburg to Moscow takes about twelve

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hours, the traveller leaving the former place at 10.20 p.m. arrives at Moscow at 10 a.m. on the following day.

There is another train which leaves St. Petersburg at 8 p.m. arriving at Moscow at 8.45 a.m.

(1). The route selected was by Charing Cross, Calais, Liege, Berlin, Warsaw to Moscow, travelling as far as Berlin by the nord express.

Experience has shown that either of the two following routes would have been preferable. That by Calais, through Berlin to St. Petersburg by the nord express and thence to Moscow; or that by Queenborough and Flushing to Berlin and thence to Moscow.

By the former route a day could have been spent in St. Petersburg instead of in Berlin, and by the latter London could have been left at 8.34 p.m. in the evening instead of at 9 a.m. in the morning.

Baggage was registered to Moscow, five packages weighing 198 lbs. costing £4/15/4. It must be remembered that on Continental railways 56 lbs. only are carried free, and on the Siberian railway 36 lbs. cost £1/1/3.

Calais was reached at 12.30 and left at 12.55 by the Jeumont train, an indifferent luncheon being served on board for six francs.

On arrival at Liege, compartment was changed, and a place, already reserved, taken in the Ostend—Berlin express, where dinner, ten francs, was served.

The German—Belgian frontier was crossed at Herbesthal where the clock was put on one hour.

Berlin was reached at 7.25 a.m. and an adjournment made to the Central Hotel close to the Friedrichstrasse Station. Difficulty was experienced in obtaining a room here, in the busy season it would be best to engage one beforehand. The military museum in the Unter den Linden is well worth a visit. Expenses in hotel 16 marks.

Left Friedrichstrasse Station for Moscow at 7.12 p.m., an indifferent dinner served in the train cost six marks.

At Alexandrovo, which was reached about 1 a.m., passports were demanded, also baggage tickets and keys; a tip of three roubles, however, settled the business without personal inconvenience. The clock was here put on another hour.

At 6 a.m. a big, burly, beaming Russian brought in an excellent cup of tea, accompanied, however, horror of horrors, by a species of cold mince pie. We arrived at the Warsaw—Vienna Station shortly afterwards and were taken round the city to the Warsaw—Brest Station where trains were changed.

Shortly after leaving Warsaw two batteries of field artillery were observed, evidently returning from drill order. Slovenly looking batteries, it was noticed that three men were seated on the limber, two on the axle tree seats, and two were riding astride the trail. I could not help contrasting the appearance of these batteries with that of the 103rd Battery as last seen, very much to the detriment of the former.

At this season of the year (June) it is very dusty on the railway between Warsaw and Moscow, and it is better to keep the windows closed and bear with the stuffiness, opening them only when the

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train is halted at a station. On arrival at a station one bell is rung, two bells as a warning, and three bells as the train is about to start.

Moscow was reached about two o'clock in the afternoon and a bed and bathroom engaged at the National Hotel for ten roubles.

We found Mr. Barth, a guide, most useful and in his company drove round the city, visiting the Emperor's Palace in the Kremlin and St. Saviour's Church. Moscow struck one as being a sad looking city full of churches, beggars and black horses.

Dinner was foolishly taken *à la carte*, cost, without wine, for two persons, twenty-two roubles, the services of the guide cost six roubles, and the droshky for the afternoon fifteen roubles.

Mr. Barth went on to the station with the luggage and the hotel was left at 11 p.m.

2. The Trans-Siberian wagon-lit train was drawn up at the platform and was made up as follows:— one first class coach, two second class coaches, one dining car and one coach for the personnel. The first class coach was divided into eight sections, seven holding two and one, three persons. Each of the two-berthed sections measures seven feet long, six feet broad and twelve feet high, and there is a lavatory, three feet broad, between every pair of sections. This lavatory is tiled and has a hole in the centre to allow the escape of water, and, therefore, a bath of some sort can be had. There is a corridor two and a quarter feet broad running the whole length of the sleeping coaches and at each end is a water closet. The windows are double throughout.

The second class coach is divided into sections to bed down four persons each, but there are no lavatories between sections and the only washing accommodation is that provided in the lavatory in the water closets.

The servants who speak only Russian keep the sections very clean, and the company is very liberal in the provision of clean linen.

Owing to the kind offices of Sir Claude MacDonald and to the courtesy of Mr. Nagel Maker, the chairman of the wagon-lit company, the writer had a two-berthed section to himself from Moscow to Irkoutsk.

The restaurant car is common to both first and second class and is divided into two portions, one being for smokers and the other for non-smokers. Some of the waiters in the restaurant can speak French, English or German, and the captain of the train and the chief of the restaurant are almost certain to speak one foreign language. The cost of living is about four roubles a day.

On the whole the train is most comfortable, though one misses the observation car of the American and Canadian railways. Owing to the fact that, between Moscow and Vladivostok, the speed, including halts, averages only nineteen miles an hour, the train runs very easily and there is little motion. The trains are also as a rule punctual owing to the ample time allowed between stations.

It is interesting to note that from the country between Moscow and Samara large quantities of so-called Normandy butter, eggs and young chickens are exported to Europe and sold in London and elsewhere.

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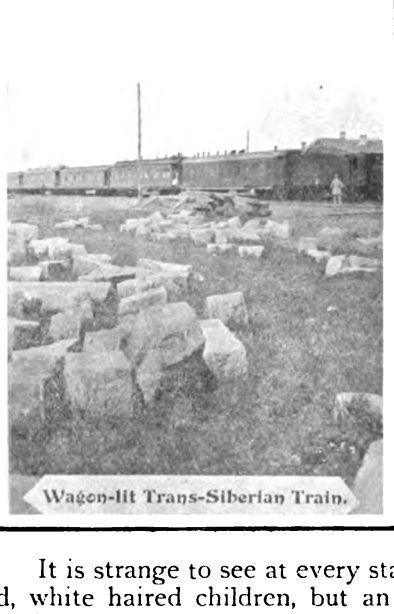
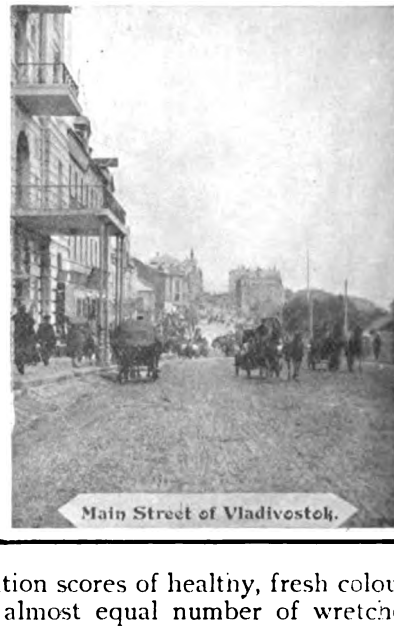
Lt.-Col. Beger and Russian Railway Guards at Kharbin.

Droskhy at Vladivostok.



Wagon-lit Trans-Siberian Train.



Main Street of Vladivostok.

It is strange to see at every station scores of healthy, fresh coloured, white haired children, but an almost equal number of wretched looking beggars.

The first place of importance passed during the daytime was Onfa, a large railway station with an up-to-date European refreshment room, bookstall and waiting rooms. Twenty-five minutes was spent here.

The temperature in the restaurant of the train at 10 p.m. was 68° Fahrenheit.

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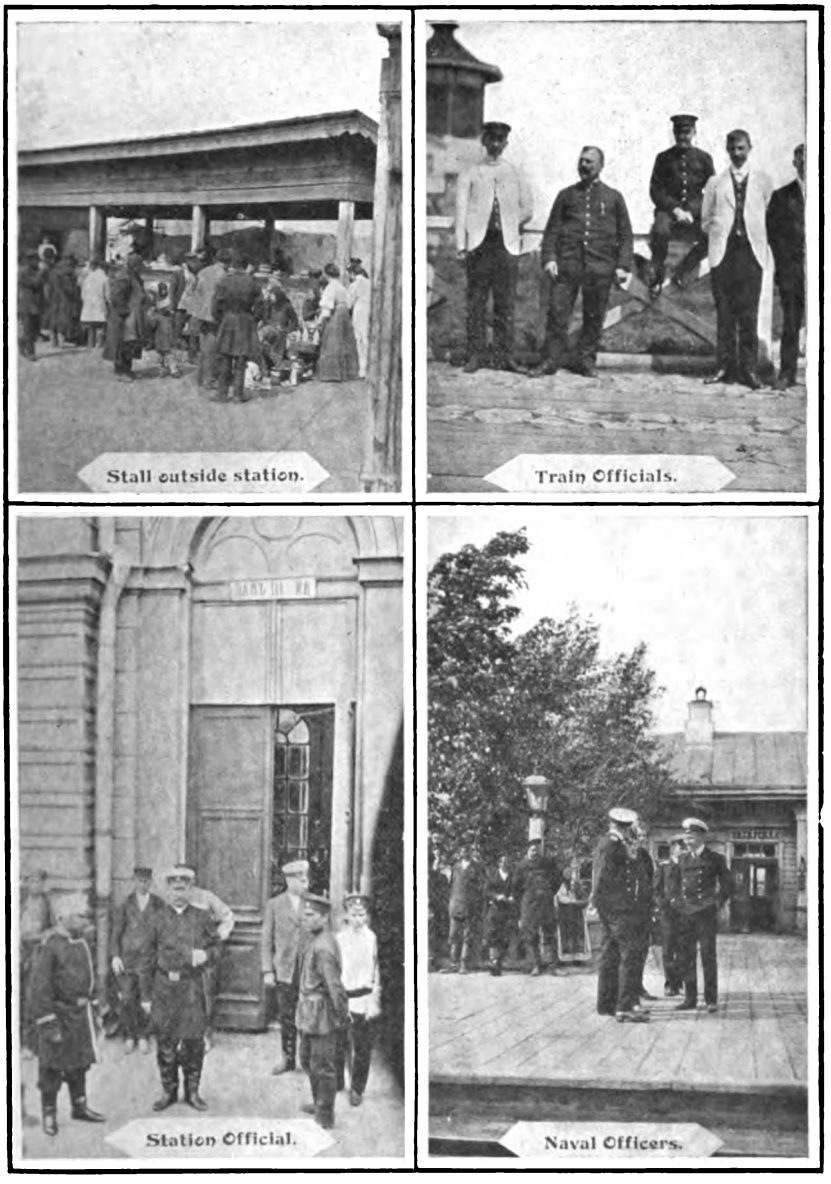

On the following day, shortly after leaving a station called Ouryoumka, a stone pillar was passed on the South side of the line. This pillar marked the boundary between Europe and Asia.

On the fourth day after leaving Moscow, Ormsk, a centre of the gold mining industry was reached. Several trains loaded with emigrants were passed going East, and also some containing well guarded prisoners. A few trains loaded with cattle were met going West.

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Lt.-Col. Boger and Russian Railway Guards at Kharbin.

Droskby at Vladivostok.

Wagon-lit Trans-Siberian Train.

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Stall outside station.

Train Officials.

Station Official.

Naval Officers.

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Irkoutsk was reached on the seventh day after leaving Moscow, and the eleventh from London. The first that one sees of the town is a big yellow cathedral, surmounted by four golden crosses and surrounded by a number of white spires and steeples, with a long low green hill in the back ground. As we draw nearer we notice miles upon miles of rolling stock, sidings and sheds, and can easily imagine the scene here a few months ago during the height of the Russo-Japanese War. The train passes over an iron bridge spanning the river Ingara and we are in Irkoutsk, the Paris of the Far East, four thousand odd miles from Moscow, every yard of which is Russian territory.

Here trains have to be changed. The scene on the platform is a strange one. A Chinaman in a newmarket coat, carrying a cane and wearing a pair of gloves, with his pigtail tucked under his coat. Russian soldiers on sentry go, marching to and fro with fixed bayonets. Smart young Russian naval officers, burly big bearded Russian colonels of infantry, Germans, Frenchmen, Japanese and Chinamen, all of us squatting on the platform, waiting for the train that is to take us on the final stage to Vladivostok.

After a long wait this drew up at the platform and was found to be exactly similar to the last. A great disappointment awaited me, however, on finding that a naval officer and a commercial traveller were to share my three berthed section.

About two hours after leaving Irkoutsk, Baikal station, the cleanest and best kept yet seen, was reached, and from here a fine view of the lake was obtained.

Three days afterwards, Mandchouria, the frontier station of Siberia and Manchuria, was reached in the middle of the night, and a halt of three hours was made.

The next day early in the morning, our train clattered over the iron bridge spanning the Sungari, and we were in Kharbin.

This place gives one the idea of being more European than any town yet seen, with its numbers of stone and brick buildings, its railway lines, its broad platforms and a railway refreshment room that would not discredit a big railway terminus in London.

A peep outside the station and line upon line of droshkys, drawn by surprisingly well fed and well groomed ponies, some driven by Russians and some by Chinamen, are seen. Passengers and their luggage are bundled into these vehicles and are driven up a broad metalled road, flanked by imposing looking stone structures.

Here we see Russian soldiers in their green uniforms, Chinese policemen in blue coats covered with hieroglyphics, and wearing straw hats, with Russian and Chinese boys selling newspapers and cigarettes.

Standing at the station entrance a German commercial traveller is noticed to drive up and direct the uniformed and numbered porter to take his things to the "express." Time here is too short for a drive into the town to see the sights.

The next place of interest is Pogravitch, the Eastern Manchurian frontier, and here the baggage of passengers from stations East of Moscow is examined.

Early on the morning of the fifteenth day since leaving London

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we reach Vladivostok. Running along the shores of a bay through vegetation as luxurious as that of the West Indies, we enter a deep cutting and shortly afterwards pull up at the station. The scene here defies description. A mob of villainous looking Chinese and Koreans surround the train and with difficulty a Russian porter is secured.

Once free of the station you realise Vladivostok during the rainy season in all its horrors. The place is indescribably filthy. The roads are un-metalled and were ankle deep in mud, the droskhys and drivers dirty beyond description. The two best hotels were full, but eventually with the assistance of an intelligent Chefoo Chinaman the Hotel Romanoff was reached and an evil-smelling, vermin-harbouring bedroom engaged for five roubles. Two good restaurants were found, the Solturo and the Swetlanka, where good meals were obtained in a clean room.

Difficulty was experienced in obtaining a berth in a ship bound for Japan, but at length it was found that a German ship, the "Lysholt," was sailing for Tsuruga in two days time and accommodation was obtained, price thirty roubles.

On returning to the hotel it was found that our fellow lodgers consisted of improper ladies, cut throat looking Circassians, and others of all nationalities, each more villainous of aspect than the last. One Circassian, redolent of rose water and stale tobacco, in a fancy ball costume and bristling with weapons, spent his time in walking moodily up and down the corridor, muttering to himself and eyeing me suspiciously. The beds were unprovided with sheets and blankets, and after loading my revolver rest was sought.

At midnight in the house opposite, which proved to be a music hall, an entertainment started and the horrid din was kept up until four o'clock in the morning. Two days were spent in this Inferno and then we embarked in the "Lysholt."

(3). The ship was found to be almost prehistoric and of that type, models of which are seen in museums or at naval exhibitions. However, she was clean and the food was eatable.

After a voyage of forty hours we were landed at Tsuruga and repaired to the Tsuruga Hotel, a new building built in European style. In the evening we left for Tokio and reached Shimbashi station at nine the following morning.

From the foregoing it will be seen that the railway journey across Siberia and Manchuria is comfortable. The arrangements at Vladivostok leave much to be desired, but a stay at that place will not be necessary when the service is properly organised. It is believed that this will shortly be carried out, when the journey from London to Tokio should be done in eighteen days, instead of in twenty as was the case in the trip described in the foregoing pages.

No one should undertake the journey without providing himself with "Guide du grand chemin de fer trans-Siberian." Société d'Impression artistique 1900. Perspective d'Anglaise M. No. 28 St. Petersbourg. Price 16 francs. This is a most interesting work and gives a great deal of information.

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APPENDIX A.

Leave	Charing Cross.....	9.0	a.m....	1st day		Difference
Arrive	Berlin.....	7.25	a.m....	2nd	„	between
Leave	„	7.12	p.m....	„	„	St Petersburg
Arrive	Warsaw.....	8.0	a.m....	3rd	„	and local
Arrive	Moscow.....	3.0	p.m....	4th	„	time.
Leave	„	11.45	p.m....	„	„	
„	Samara.....	4.28	a.m....	5th	„	.....1.19
„	Oufa.....	8.9	p.m....	6th	„	.....1.42
„	Omsk.....	7.44	p.m....	8th	„	.....2.52
„	Irkoutsk.....	3.0	p.m....	11th	„	.....4.56
„	Baikal.....	5.14	p.m....	„	„	.....5.0
„	Tchita.....	2.11	a.m....	13th	„	.....5.29
„	Mandchouria.....	3.25	a.m....	14th	„	.....5.48
„	Kharbin.....	8.0	a.m....	15th	„	.....6.24
„	Vladivostok.....	9.45	a.m....	16th	„	.....6.46

APPENDIX B.

Cost of Journey.

	£	s.	d.
1st class from London to Vladivostok.....	46	18	6
Baggage to Moscow	4	15	4
Expenses from London to Berlin	1	11	0
Expenses at Moscow	5	12	0
Expenses from Moscow to Vladivostok	4	16	0
Expenses at Vladivostok	4	0	0
Steamer to Tsuruga	3	0	0
Hotel in Japan		15	0
Fare to Shimbashi	2	6	0
	73	13	10

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Makeshift method of entraining Field Artillery.

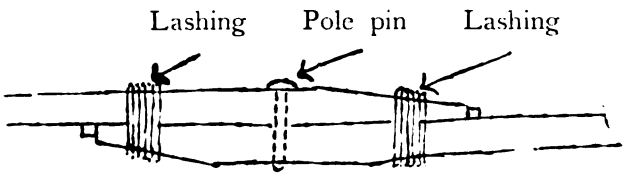
By Q.M.S. Instructor in Gunnery T. Brady, R.G.A.
(Communicated by Major T. H. Crozier, R.A.)

THE difficulty of embarking or entraining Field Artillery by the methods laid down, in places where materials for constructing a ramp, or the stores necessary for a derrick may not be available, led to the idea that it may be possible to carry out such work by using the stores always with the guns on service.

The following is an account of a shift carried out in order to show the possibility of such a scheme.

A pair of sheer spars was built up of the limber poles as follows:—

The ends of two poles were placed together as shown in the sketch, and a pole pin passed through the hole in each pole; so that the longitudinal thrust was taken by the pole pin, as a shearing strain, and not by the lashings.

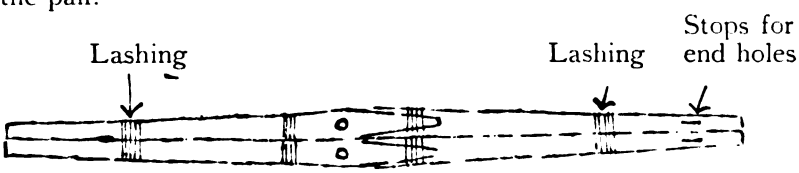


The pole pin was prevented from dropping out by a few turns of spun yarn.

Light dragropes were used as lashings, and were tautened by being driven up the wedge shaped ends of the poles.

The two poles thus secured formed a rigid spar 21 feet long.

Two such spars were placed side by side and lashed together in two places, forming one composite sheer leg. Four poles were, therefore, required for each sheer leg, eight poles altogether being used for the pair.



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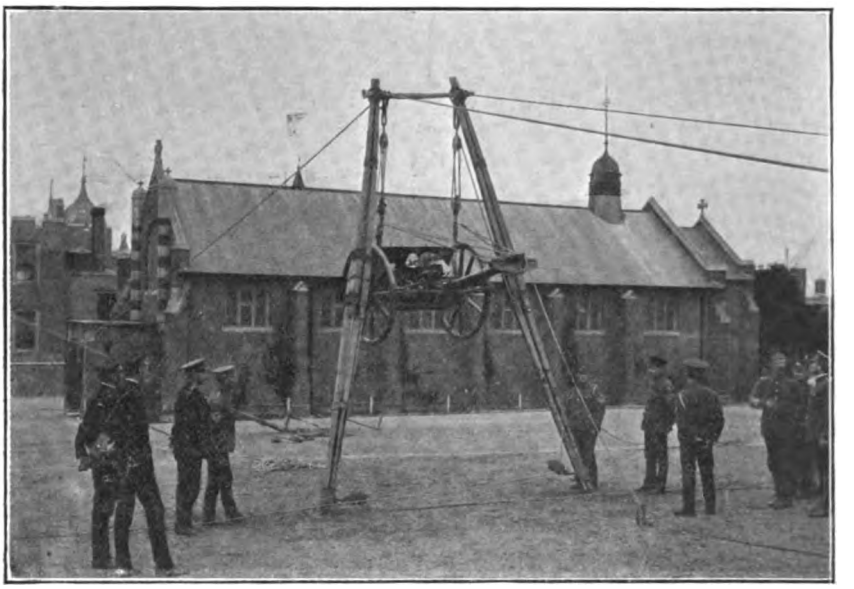

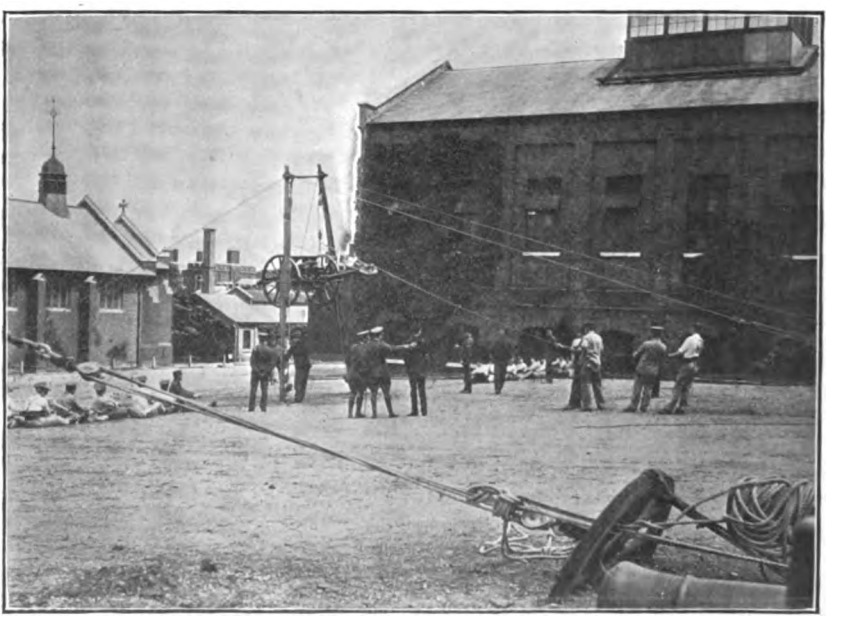

Crossing the legs as in the ordinary way of rigging sheers, would not have given sufficient height of lift with spars only 21 feet long, so that the following method was adopted.

The tops of the spars were placed 5 feet apart and lashed to the ends of half a jointed pole, which formed a distance piece.

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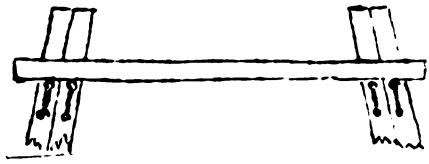

The stops on the poles for the pole bars were placed in the end holes, and the poles were turned in such a manner as to have the stops away from the direction of heel of the sheers. The stops thus formed a support for the jointed pole.

The feet were placed eleven feet apart, and connected by a drag-rope to prevent further opening.

Pieces of plank placed under the feet formed rough shoes, into which the steel at the ends of the poles gripped.

The feet showed no tendency to slip even at extreme angles of heel.

Two pieces of 2½-inch rope were used for side-guys and back-guys. One side-guy and one back-guy being secured to the head of each spar.

A clove hitch near the middle of the rope was put over the top of the spar, and slipped over the end of the distance piece, serving to bind it tighter to the spar.

The short ends were used as side-guys, the long ends as back-guys.

A 1·1 picket holdfast was used for each back-guy, and single pickets for the side-guys.

As only eight men were available to raise the sheers, a single block was hooked to each back-guy and a fall rove, gaining a power of 2 to 1.

Few men being available, two luff tackles were used to lift the weight; the double blocks being hooked to selvagees passed over the head of the spars and round the distance piece.

Two single blocks were lashed to the feet of the spars, and the falls led through to opposite sides.

The gun and carriage (18-pr. Q.F.) being the heaviest part of Field Battery equipment was used as the weight. (24 cwt.).

It was run between the sheers and lifted by the two tackles from a point about a foot in front of the feet. It was raised until the bottom of the wheels were 8 feet clear of the ground, the position shown in the photograph, and a further 2 feet of lift was possible before the tackles came chock-a-block.

The back guys were eased off and the sheers heeled outward to 27 degrees, the gun and carriage being lowered with its centre 10 feet in front of the feet.

The gun and carriage were lifted from this position and the sheers heeled inboard, the weight being lowered in line with the feet.

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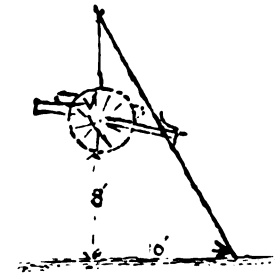

The carriage was next placed so that the gun was parallel to the feet. The weight taken up 10 feet clear of the ground and lowered 10 feet out by heeling the sheers. In this case the nearest wheel was 7½ feet clear of the sheers when lowered.

Two 80 feet picketing ropes would serve for the guys and two others for lifting the weight; but dragropes could be used for all guys, on the double where necessary.

All lashings can be got from the dragropes and lashings carried on limbers and ammunition wagons.

If the number of gunners of a Field Battery had been available, no tackles would have been required. The only stores required other than those at present carried by a battery with the guns, would be 6 single blocks.

A single wheel holdfast would serve for the two back-guys, and a couple of picketing pegs for the light strains of the side-guys.

The safe thrust of a single pole is over 15 cwt. There is no possibility of the composite spars breaking at any other point than the centres of the poles, so that the safe load of each pair of poles is the same.

When the two spars are lashed together to form a sheer leg, they are equal to a thrust of 30 cwt. Making an allowance in case the two do not bear equally, each sheer leg would easily take 25 cwt. So that the pair are fit for 2½ tons.

This is well outside any thrust likely to come on them in lifting the heaviest weight to be met with in a field battery.

The sheers could be put up alongside a river or railway, sufficient heel and height of lift being obtainable to lower on to a pontoon or to clear the side of a railway truck. Or if one foot is placed on either side of the line, the space between the sheer legs is sufficient for any truck to pass between the legs, and under the gun wheels when raised. Using this method the sheers could be kept vertical and the guys would not require handling.

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Notes on the Tactical Employment of Artillery in Enclosed and Wooded Country.

By MAJOR H. C. WILLIAMS-WYNN, R.F.A.

PREFACE.

THE following notes were drawn up after taking part with my battery in both manœuvres alluded to, on one occasion in the defence, on the other in the attack. A certain sense of dissatisfaction with the part played by the artillery on both occasions, but especially in the attack, led me to investigate the principles on which the artillery was usually employed, and the conclusions arrived at are that too many guns were used attached to infantry brigades, and not enough was kept under the immediate control of the G.O.C. Divisions.

In an important memorandum on the subject issued by Sir John French in November last the matter is summed up as follows:—

"A Divisional Commander should keep the bulk of his artillery "in his own hands leaving the execution of his ideas to his C.R.A. " . . . . He will usually place some sections of guns under "his Infantry Brigadiers in the attack, and under the Com-"manders of sections of defence in a defensive position, and "sometimes may attach considerable portions, or even all his "artillery, to infantry brigades; but in the latter case be must "remember that by so doing, he abrogates his functions as com-"mander of a force of all arms, and becomes the director of "several mixed columns."

I have not the slightest intention of criticizing the dispositions of the experienced Generals who were in command of the troops, which were probably dictated by causes outside my knowledge, but I have set myself to discuss whether, from an artillery point of view, the difficulties of the country could have been to any extent overcome by a different method of handling the guns.

Artillery brigades and their attendant ammunition columns will occupy so much valuable road space in future operations that it is essential that we should discuss how best to get the full value from every gun in any sort of country.

With the appointment of a C.R.A. to each division a new era dawns for the divisional artillery, and at future "pow-wows" we shall no doubt have many interesting discussions raised on the tactical employment of the artillery.

To revert to the accompanying notes; a distinguished General (infantry) to whom I submitted them, only thoroughly disagreed

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with the final paragraph, of which he says, " It is waste of highly " trained personnel. Of course you must organize your force " to suit any special country . . . . but never would I turn " a single artilleryman into a mounted infantryman." This indicates, I think, a high appreciation of the value of a strong divisional artillery.—*H.C.W.-W.*

September 11th, 1907.

THE experiences of the manœuvres which constituted the inspections of the 1st and 2nd Divisions at Aldershot this year (1907), must have caused most artillery officers to reflect upon the modifications in our tactics necessitated by the enclosed and densely wooded character of the country in which we operated.

The duties of field artillery generally in attack and defence are set forth in the Training Manuals, and the normal method of carrying out these duties is clearly explained in " Notes on Artillery in Attack and Defence," by Colonel J. P. DuCane, which were officially circulated in the Command on November 9th, 1905. Both these authorities, however, appear to contemplate a field of operations where distant ranges will be up to 6,000 yards, and batteries will rarely come into action within 1,500 yards of hostile infantry.

A few reconnaissances about Finchampstead, Arborfield Cross or Strathfield Saye soon showed that our scale of ranges must be considerably modified for the operations in hand. 2,500 yards became a "distant" range, and for close support of our infantry in both attack and defence, 500 yards and under was frequently the longest "decisive" range admissible.

Under these circumstances, the power of our guns was often wasted, and at close ranges it was open to question whether our support was not too dearly purchased by the number of rifles displaced. The writer diffidently hazards the opinion that fewer batteries employed in the same manner, as was the artillery at the recent inspections, could have produced the same effect, with a great saving of space on the narrow and not too numerous avenues of approach to positions of attack and defence.

It is thought, however, that a scheme of tactical employment may be evolved from our recent experiences, which will obtain the utmost value from every battery allotted to a division, even if the theatre of operations be as enclosed and wooded as South Berkshire.

It is of course understood, that the principles laid down in the Training Manuals are constant, and we are only endeavouring to work out the best system of applying them to work in a wooded country.

The Attack:—

The advance and feeling for the enemy is generally done in a number of small parallel columns, depending on the number of roads leading directly to the front. With each of these columns there should be *some* artillery, the number of guns depending upon the nature of the country which any particular column has to traverse.

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The duty of this artillery is to brush aside the divisional cavalry of the enemy and enable the infantry of the column to get in touch with the enemy's advance guard. When the road allotted to a column is on low ground, along the valley of a river with friendly troops advancing on the other bank, a section should be sufficient. These guns should march with the advanced guard, and their commander himself should ride with the vanguard.

The remainder of the artillery should not be allotted to brigades, but kept under the direct orders of the G.O.C. division. To this end it should march on one or more roads leading to the front on the flank where the G.O.C. can see from the map that it will be most likely to be able to find good positions from which to make its power tell. Its position on the march should be farther to the rear than ordinarily allotted to it; in such country as we are now contemplating, the infantry must first draw the fire of the defender's guns before the artillery of the attack can be of any use, and for this reason the bulk of the guns should be placed behind the whole of the main body. The artillery brigade commanders, however, with their staffs must ride at the head of the main body with the divisional C.R.A. During the march, battery officers must be sent to reconnoitre all localities which seem from the map to promise anything of a field of view and fire. The C.R.A. must, of course, apportion positions to be reconnoitred, to the various brigades to prevent clashing. These officers' patrols, being well mounted and presumably bold riders, can take great risks, and should be able to get to the locality to be reconnoitred ahead of their own divisional cavalry. They are not looking for the enemy, but for a position from which to bring artillery fire to bear on him, so their reports must give the extent and direction of the field of view even if none of the enemy's troops are visible at the time. The officers detailed for these reconnaissances should report to their own brigade commanders by the time the main body is up to the place reconnoitred, or even before.

If the advance guard has met with opposition, and the main body has been forced to deploy, any position with a field of fire will have to be occupied by the few guns attached to the nearest column. These must now be reinforced by the C.R.A.

When the opposition begins to yield, and the columns can continue their advance, the guns attached to them will limber up and accompany them, but the remainder of the artillery which has been brought up by the C.R.A. must remain on the position "in observation," until their own infantry have passed beyond their field of fire. They will then limber up and trot up to the main body.

It will often be found that, while no positions are obtainable in the front allotted to a division for its own guns to support their infantry advance, a good field of fire is obtainable to enfilade the portion of the enemy's line opposed to friendly troops operating in parallel columns on the flank of the division, whereas the ground allotted to these troops affords artillery positions suitable for supporting the advance of the division. When a river is the dividing line between two divisions this will constantly be the case. The divisional commander should have no hesitation in posting his artillery,

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where it can effectively assist the neighbouring friendly troops, reporting his action if possible at once to the G.O.C. the whole force, and asking that some batteries of the next division may be told off to return the compliment by supporting his advance.

If the enemy brings guns into action to oppose the few guns attached to columns, when the latter are driving in the divisional cavalry and advanced troops of the enemy, the oblique fire of the neighbouring division will take them by surprise and disconcert them.

Until the enemy's troops make a stand, however, it is useless to bring up the whole artillery of the division, but the C.R.A. must arrange good communication so that he can readily strengthen any of the columns with one or more batteries, if positions are available.

When the enemy takes up a defensive position, his guns are soon bound to disclose themselves, though they may wait for a target till our infantry are within 1,000 yards. These now clamour for the close support of their own divisional artillery. But how is it to be given? A brigade is pushed forward at the trot along the narrow lanes leading to the firing line, greatly to the discomfort of the reserves and brigade ammunition supply details, and endeavours to come into action as near the firing line as possible; it will lose heavily in horses in doing this, affordin~ a much desired target to all the guns and half the rifles on the enemy's position. It imparts confusion to nearly a quarter of a mile of the attacking line, compelling the firing line to close to either flank to leave a gap for the fire of the guns, and thus causes a cessation of rifle fire at a most critical period.

Such "close support" will be found by the infantry to be dearly purchased. The Germans say that a battery cannot come into action at all within effective rifle fire of an enemy. The French say that it can be done with a shielded battery, but that the latter cannot move afterwards.

"Fiat experimentum in corpore altero"!

It is clear that the guns attached to columns must come into action at close range against the enemy's artillery and must be prepared to attract a very unpleasant amount of attention from the latter. Ranging will be a matter of a couple of rounds in such a situation, and the utmost must be made of the gun's speed of fire. Meanwhile the bulk of the divisional artillery will have held on to positions further in rear, whence a good field of fire is obtainable, if not against their own division's point of attack, at least against some portion of the enemy's position, and this they must continue to bombard, for what helps neighbouring friendly troops, helps their own division also indirectly.

The principle in fact in the employment of the divisional artillery in the attack should be that, while a few guns must follow up the infantry closely, the greater part of the artillery should not quit positions in rear from which it can cause *any* effect, until they have ascertained that there actually exist more advanced positions for them with a better field of fire. An early reconnaissance of all positions by artillery officers, and co-operation with the artillery of adjacent divisions are also notable points when operating in wooded country.

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Defence:—

In defence, the principle of attaching a field artillery brigade to each infantry brigade is free from the objections which have been urged against such a course in the attack.

In a rear guard operation especially it would be unwise to keep the whole of the divisional artillery immediately under the divisional commander, but when a defensive position has been definitely occupied, the character of the ground may very likely be such that there is only one really good artillery position in the area; in this case it would be preferable to reduce to a few guns those sections of the defence which afford them no field of fire, and mass the remainder under the C.R.A. The side which adopts the defensive, should usually have some knowledge of the line of country over which they are retreating, which will enable them to occupy beforehand the few available artillery positions from which guns can cover the withdrawal of the sections or batteries which are in immediate contact with the enemy's advanced troops. These latter must be prepared to run some risk of capture, but in a wooded country it will be hard if they cannot keep their teams under cover while in action, even at the closest ranges, and they must be withdrawn by sections, or even single guns, in such a way that the advancing enemy is never quite certain where the last gun has gone.

Of course if the defender is retreating over unknown country, early reconnaissance of more retired positions by artillery officers is absolutely essential. The normal custom for the artillery of the defence is to open fire at long range in order to compel an early deployment of the attacker. Such a course would hardly be successful, even if practicable, in a wooded country. The defender's guns should rather wait till they have a definite target and continue their fire till the last possible moment consistent with safety.

Night operations:—

Operations at night are not much affected by the wooded nature of the country, except that the previous daylight reconnaissance must be more careful. The difficulty of arriving at a given position on a dark night is greatly increased if unfenced tracks through dense woods have to be traversed. The artillery of the defence has here a distinct advantage, since the range and bearing of all defiles and avenues of approach will have been taken at daylight. As regards opening fire at night, the recent manœuvres afford no lesson, as, with blank powder, artillery officers perhaps scarcely grasped the responsibility of endangering their own infantry. The Japanese appear to think that is necessary, but, except in the case of batteries of the defence firing on a road or bridge known to be crowded with the enemy's troops, it is probable that little will be gained by not waiting for the daylight.

The woods on the whole favour the attacker, enabling him at dusk to push guns to the very edge of the open ground, where they can be entrenched during the night. When this can safely be done, it is better than moving the batteries after dark—a difficult operation

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in thickly wooded country. These batteries must not be expected to move after daylight until the enemy has evacuated his position,—in fact it would be impossible for them to do so,—it will be advisable, therefore, to detail some batteries to deal with the counter attack, to remain either in "position of readiness," or—if there is only one possible position from which such attack could be engaged—in action "in observation." If the latter course be adopted, the batteries should be instructed not to open fire with the others, as the revelation of their presence might cause the defending commander to alter the direction of his counter attack.

The question of direct or indirect fire is not worth discussing in connection with operations in a wooded country. It must be left to the officer on the spot, who will generally find it impossible to select a position from which all his guns can lay over the sights.

The utmost that he can expect is that he will be able to secure a good observing station near his guns, and that they will be able perhaps, to give the direction without aiming posts, but he will almost certainly have to employ clinometer elevation for some of his guns, and in such a case it is far simpler if they are all laid for elevation by clinometer.

To sum up, if it were certain that a proposed theatre of operations were all thickly wooded, and that no advance or retreat from its limits were possible, it would be better to reduce the number of guns accompanying the division and use the gunners as mounted infantry, but when a belt of wooded country occurs in an advance or other strategical movement, special tactics are required to obtain proper value from the artillery, and keep it in hand ready for a change in the character of the country, which will once more enable it to fulfil its normal rôle.

Firing over Friendly Infantry.

By CAPTAIN N. E. B. BELLAIRS, R.A.

IT was with very great interest I read the article entitled as above by Lieut.-Colonel R. G. Strange, R.F.A., in the September Journal.

That the lessons of the Russo-Japanese War as to the possibilities of artillery fire up to practically the moment of assault have not been altogether assimilated by our infantry was recently evidenced at the siege manœuvres at Chatham, when directly antagonistic opinions were expressed, on the one hand by the artillery officers, and on the other by the infantry officers present.

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On this occasion the infantry had arrived at about forty feet below the crest line, and the question was whether artillery from a parallel ridge ,1,500 yards off, could continue to fire at that crest line with percussion shell.

Not having an 18-pr. Q.F. range table by me, I made the following calculations with that of a 15-pr. B.L. gun. Readers can easily make similar ones for the 18-pr.

At 1,500 yards.	Height.
50% of rounds should fall within	3·3 feet
100% do. do.	3·3 × 4 = 13·2 „
5 minutes error in laying gives vertically	2·18 × 3 ft. = 6·54 „
1 do. do. do.	1·31 „
∴ 3 do. do. do	3·93 „
This must be doubled as it may be either high or low	= 7·86 „

∴ total height zone = 13·2 + 7·86 = 21·06 feet crest is centre of zone.
∴ infantry are safe 10·53 feet below crest.

A similar calculation for 3,000 yards shows infantry safe at 42 feet below crest.

I have allowed for a three minutes error in laying, to which gun layers in the mounted branches have been trained.

I was immensely struck by the remarks made by the Officer Commanding the machine guns, 2nd Japanese Division, on the use of these weapons at the battle of Mukden.

He was firing at some infantry trenches at a range of about a mile, and he remarked that he had to cease fire "because our infantry had got within forty yards of the trenches." It is safe to say that the machine guns in keeping the defenders heads below the parapets till the moment of assault must share the credit of the successful capture of the position. One may go further, and say that without supporting fire for this purpose—for which artillery is eminently suited—the successful capture of the trenches would be problematic, and, in the event of success, extremely costly.

Writers in the press have a habit of comparing the weight of metal discharged by artillery for each man of the enemy killed to that of the infantry, and making deductions from the same as to artillery fire effect being more moral than real. They quite overlook the fact that a large portion of the fire is directed to prevent an enemy interfering with our own infantry, by keeping them from showing their heads above the trenches, rather than with a view of destroying that enemy, and the comparison is hardly a fair one.

The safety regulations laid down for coast artillery are such that an officer conducting practice, though it may be perfectly safe to do so, would inevitably get into trouble if he fired over boats, and the authorities responsible for the object lesson at Meerut deserve great commendation for their courage.

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The need of a "One-Man" rangefinder for field artillery

With a description of the Barr & Stroud Instrument as supplied to the Japanese Artillery.

By LIEUT. L. St. J. R. CLUTTERBUCK, R.F.A.

BATTERY Commanders are unanimous in the opinion that our present range finding equipment is far from being all that could be desired. Even with the best range takers, errors are frequent, and the time taken is long. So that, at long ranges, where accuracy is essential, much time is wasted and ammunition expended in finding the " gun range," as the rangetakers' range is often not near enough to give a 300 yards bracket at the first attempt. This is, of course, much more the case when indirect fire is used and an observation party at some distance from the battery has to be employed. While in cases in which only a fleeting opportunity is offered, and rapidity is of supreme importance, the rangetakers' cannot pick up, and take the range to, a difficult target, quickly enough to be of use; and the range given is useless unless it can be relied upon. Indeed most battery commanders trust to their own estimation at medium and short ranges; and this cannot fail to be affected by light, ground, &c., however skilled they may be.

These considerations are increased in importance by the introduction of quick firing field guns, for the advantage rests entirely with the artillery which can first bring an effective fire to bear on its opponents, for, once the elevation and fuze are found, it can bring such a destructive fire to bear on its targets, as to render them useless by preventing movement or exposure of any kind, if it does not inflict such severe losses as to disorganise them altogether. A noticeable feature of the action of artillery in the Russo-Japanese War, was the impossibility of moving guns once in action except by night; and artillery which could effect this reduction to immobility within a few seconds of the appearance of hostile guns, either in action or on the move, would undoubtedly hold the advantage. Against infantry, earlier deployment could be enforced, and movement across ground exposed to artillery fire would be rendered impossible from the moment the guns came into action.

Every alteration and improvement is in the direction of increased speed and accuracy. Quick firing guns, rapid systems of ranging, and telephones, have become a matter of course. The only part of the equipment which is not up to the rest is that used for range finding. And the necessary improvement can only be obtained by the introduction of an efficient "one-man" range finder. The accuracy of fire of the new 18½ Pr. gun, with its low trajectory, would make it possible, at ranges up to 4,000 yards, to open with effective time

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shrapnel at once, *if* the battery commander could only rely on his rangetakers' range. The advantage of this against massed troops, guns on the move, and in any of the many cases where guns have only a minute or two in which to get their effect, would be enormous.

The mekometer at present in use costs, complete, £11/5/-, and weighs 9lb. 2oz. inclusive of both instruments, cord, &c. It has telescopes magnifying two and six diameters respectively. The former is too low powered for present day targets, the latter has such a small field that it is extremely difficult to pick up an indistinct target, and keep it in view during movement, either of the right angle man to his position, or of the target. It has an error of 2% at 2,000 yards, or 40 yards. This increases with the range, so that at 5,000 yards, even with the double base, it ceases to be a reliable guide. In addition, the time spent in settling on the points to which the ranges shall be taken is considerable, and results in innumerable errors, especially with the indistinct targets now met with.

A description follows of the " Barr and Stroud rangefinder, F.Q. type, on mounting H.M. type, for use with Field Artillery."

The chief objection to this instrument is its cost, £200; but if this was considered prohibitive, an adaptation of the Infantry rangefinder, which costs £70 complete, would be preferable to any two-man instrument. With a base of 1 metre (39·37 inches), its "uncertainty of observation" is only 20 yards at 2,000, and 75 at 4,000 yards. Its weight, in case, is only 10 lb., and it magnification fifteen diameters, the same as that of the signalling telescope, which is a very good one. And its accuracy could be increased by the use of a slightly longer base. But a tripod mounted instrument is far steadier and undoubtedly preferable for work at the ranges common with field artillery.

The principle of a Barr and Stroud range finder is shewn in diagrams I., II. and III. The rays from the object, B_1 and B_2, are received by reflectors R_1 and R_2, and transmitted through object glasses L_1 and L_2, to the centre of the instrument, where two small mirrors, M_1 and M_2, placed one above the other, reflect the beams outwards through an eyepiece, E_1. In this way two partial images of the object are seen in the field of the (right) eyepiece, as in diagrams II. and III., one over the other. If these partial images are made to coincide when an infinitely distant object is viewed, then, on the object's approach to measurable range, they separate, and are seen as in diagram III., the rays coming in as B_1 and B'_2 from the object. The ray from B'_2 is deflected by a prism P (movable) until the images coincide. The amount the prism has moved is measured on a scale S, seen through the left eyepiece, E_2.

It will be seen that the object observed must present a "line" which can be cut by the "separating line"; it is better if this is straight, but not essential, and any line—the trunk of a tree, the crest of a hill, a fence, a gun-wheel, if " end on," is suitable; and a line of some kind could easily be discovered with a powerful telescope. The great advantage is apparent that, with such an instrument, a moving object can be kept in view, and the range to it read off the scale as frequently as desired.

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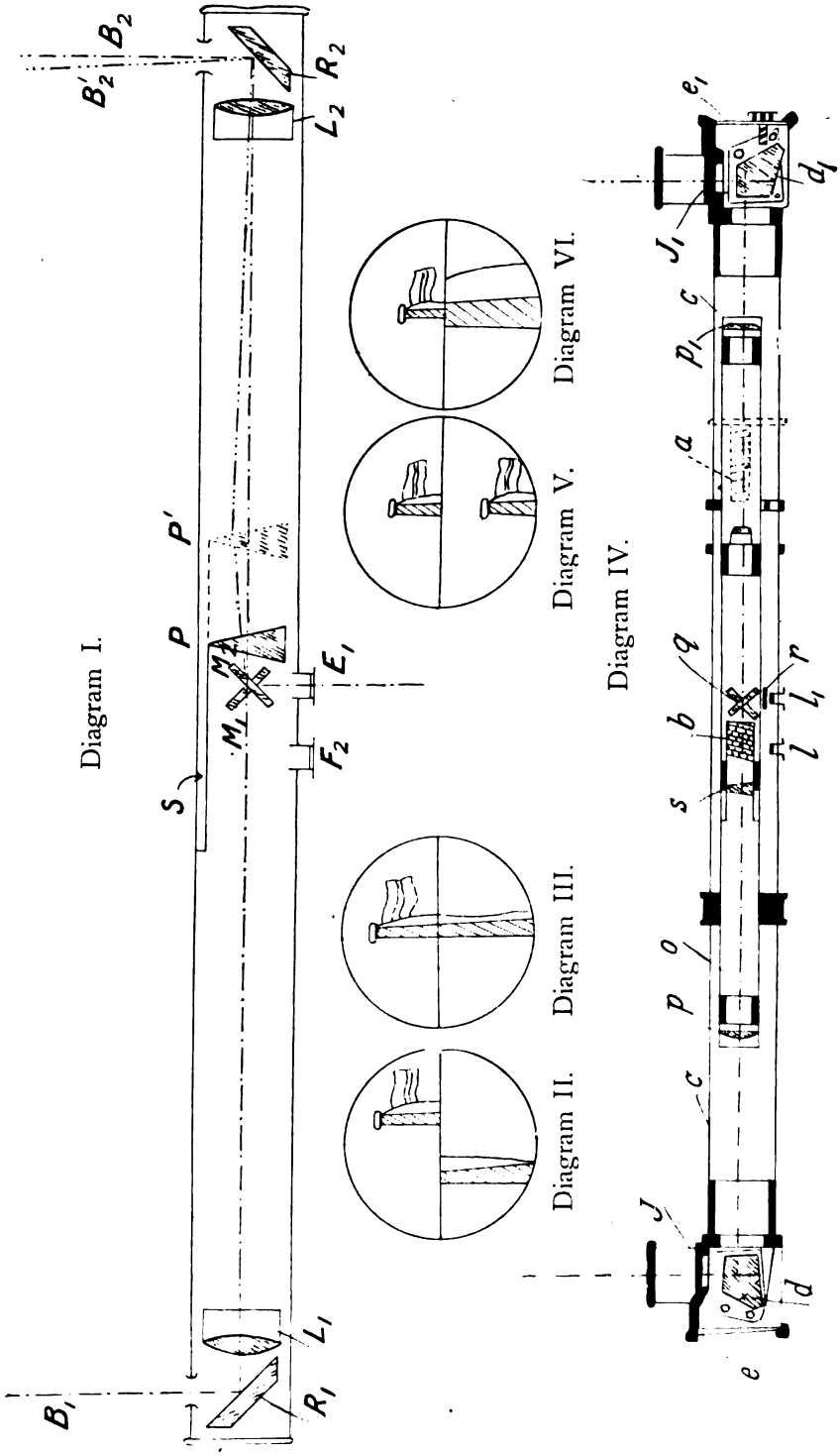

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The field artillery instrument is constructed largely of aluminium, and is covered externally with brown leather. It is fitted with pads on the ends to prevent damage by rough handling. The instrument itself consists of an outer tube, end pieces with pentagonal prisms, inner tube with object glasses, eyepiece prisms, and scale, and a pair of eyepieces fitted on the outer tube, with a rubber facepiece. The details are shewn in diagram IV.

The outer tube, C, is fitted at each end with a pentagonal prism, d and d_1. These prisms are constructed on the "Optical square" principle, that is, the reflecting surfaces are so disposed that the angle between the entering and reflecting rays is constant, and rotation of the prisms in the plane of reflection—e.g. by slight distortion of the outer tube while working—does not sensibly affect the position of the reflected images.

The prisms are supported in castings forming the end pieces of the outer tube (e, e_1). The prism at the right hand end is capable of being moved relatively to the tube by means of a worm g, and worm wheel h, which will be found at the right hand end plate of the instrument.

Opposite each end of the pentagonal prisms is a window J, J_1 of optical glass, the window at the left hand end is fixed rigidly, but the one on the right, which is slightly prismatic in form, is capable of being rotated in its holder by means of a worm and worm wheel on the edge of the window holder.

The outer tube also carries two eyepieces, l, l_1. These are inclined at an angle of about 45°, owing to the arrangement of prisms in the centre of the instrument; but the arrangement also enables the observer to keep a very steady position when holding the instrument in his hands. A "finder," consisting of a small tube with a pin hole, is fixed over the right eyepiece, to enable the observer to rapidly align the instrument. This can be done without removing the head.

The "inner tube," O, is "geometrically supported" from the outer, so that any bending of the latter in working does not disturb it. It carries an object glass, p, p_1, at each end, and in its centre, a set of "eyepiece prisms," q, with a "separating prism," r. The eyepiece prisms turn the rays coming from the object outwards and upwards into the right eyepiece. The prism r, gives a clearly defined line between the images from the right and left eyepieces.

The scale, b, is spiral, and is wound on a drum which is attached to a cylinder, threaded to take the "deflecting prism," s, and externally to gear with the working head, a. The scale reads from 500 to 20,000 yards.

In taking a range, the instrument is first aligned on the object by the "finder," so that its image appears in the field of the right eyepiece, and is cut by the separating line, preferably at some point giving a clearly defined straight edge. There will then be seen two partial images, one above the other, as in diagram II. These are brought into alignment, as in diagram III., by turning the working head, a. Then the range can be read off the scale by the left eyepiece. The time necessary to align the instrument on a fresh target, and take a reading, is about ten seconds, and subsequent readings

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can be taken as frequently as desired.

The separating line should always cut some straight edge of the object at right angles, or nearly so. A line three feet long is sufficient at any ordinary range, say of 4,000 yards; a horizontal line being observed by setting the instrument up vertically, with its end on a stone.

For taking ranges quickly, where extreme accuracy is not required, the instrument can be held in the hands. But for longer ranges, where time allows, the tripod is used. This has a revolving top, and collapsible legs, and carries the range finder in rings on the top. The whole is packed in a leather case, and may be carried on a limber, or for short distances, slung on the back. It weighs, complete in case, with mounting, about 30 lbs. (the instrument in case 15, and the mounting 15). The base is 54 inches, and magnification 24 diameters. The "uncertainty of observation" in the following table, is as supplied by Messrs Barr and Stroud. A few trials of a similar instrument, with the same base, but on a coast defence mounting, showed that these may be taken as "probable error." That is to say, that at a range of 4,000 yards, 50% of the readings would be between 3,970 and 4,030, and all between 3,940 and 4,060. But trials of the actual instrument under practical conditions, would, of course, give more reliable information.

Approximate uncertainty of observation at:—

800 yards	=	1 yard
1,000 "	=	2 yards
1,500 "	=	3 "
2,000 "	=	8 "
3,000 "	=	18 "
4,000 "	=	30 "
5,000 "	=	50 "
6,000 "	=	70 "
7,000 "	=	100 "
8,000 "	=	130 "
9,000 "	=	160 "
10,000 "	=	200 "

Two adjustments are provided, one for "halving," the other for "coincidence." The "halving" adjustment consists in moving one partial image towards or from the other, at right angles to the separating line, till the images, when brought into alignment, show a complete image of the object, giving neither duplication, as in diagram V., nor deficiency, as in diagram VI. It is carried out by the "milled head," *h*, actuating the worm, *g*, and worm wheel *f* (diagram IV.), which moves the pentagonal prism, d_1. On working the head in one direction, the image will be duplicated, in the other, deficient. The adjustment is made by moving it so that the image, when cut by the separating line, appears exactly complete.

It can be made on any object at a distance greater than the range shown on the scale, and should be frequently tested, as opportunity offers.

The coincidence adjustment should be very seldom required. It is designed to make the scale read the true range when the partial

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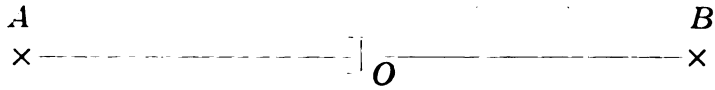
images of the object are in correct alignment across the separating line, and is effected by moving across the capstan head which revolves the right window holder. It may be carried out in three ways:—

1. By setting the scale at infinity, and observing on the moon or a star, near the horizon. At least five readings should be taken, and if the mean is infinity, the adjustment is correct. If not, set the scale at infinity, adjust the window glass until the partial images coincide, and take five fresh readings, correcting further if necessary.

2. By observing on an object at known range. This, if short, must be known very accurately. It is carried out in the same manner as above, except that the scale must read the known range instead of infinity.

3. In the field it may be tested by sending two men in opposite directions, with poles or rifles, telling them to place themselves in a straight line with the instrument, and go to nearly equal distances.

Suppose A and B to be the marks, O the observers position.



Take the range of each mark carefully, by, say, five observations; carry the range finder to one mark, and take the range to the other, also by five observations. The mean in the last case should be the sum of the two mean ranges.

Suppose AO = 846·5 yards, and BO = 838 yards; AB should be 1684·5 yards.

Say the range AB is measured 1691 yards. Then the instrument reads too high.

Take the difference, 6·5 yards, multiply by 2, = 13 yards.

Subtract from 1691, and we have 1678. This is the true range AB. Get the range on the instrument, and correct as in the first method. The mean of five readings of the range AB should be taken to see that the adjustment has been correctly made; as a check, the range finder should be taken back to O, and the ranges OA and OB again taken, when their sum should be 1678 yards.

If the range AB is *less* than the sum of OA and OB, the instrument reads too low, and twice the difference should be *added* to the reading for AB to get the true distance.

Any well defined marks may be used instead of men with poles; the station O being taken in the line joining them, and near the middle of the distance.

The chief advantages, as far as field artillery is concerned, of a one-man rangefinder, with the special advantages claimed for this one, may be summed up as follows.

1. It is fairly light and not bulky.

2. It requires one observer only, thus avoiding the necessity for communication between men at different stations, and consequent liability to errors. This is, perhaps, its chief advantage over the present mekometer. The method of aligning two partial images in one field admits of greater accuracy than is possible when cross wires or pointers, which obstruct the view, are used.

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3. It is very easy to learn and work.

4. The readings depend on the base length, the angle of the deflecting prism, and the focal length of the object glasses, and the graduations of the scale. These are not delicate parts, likely to become deranged through wear. It is claimed that all play between the "working head" and the deflecting prism and scale has been eliminated.

5. It is stated to be free from liability to derangement; but this can only be verified by actual use.

6. It is rapid, eight to twelve seconds only being required to align on an object, and read its range.

7. A moving target can be kept in view, and the range read as often as desired.

8. The eyes have not to be removed when taking several ranges, and they are protected from extraneous light by an indiarubber facepiece.

9. Once adjusted, it is always ready for use.

10. It is both quicker and more accurate than the mekometer, and can be used effectively from behind cover.

Its chief disadvantages are:—

1. Cost.

2. That it will not stand rougn usage; and in this respect is undoubtedly inferior to the mekometer, but the latter is not accurate or reliable enough to be suitable for modern quick firing guns.

3. Liability to be affected by temperature. But, once adjusted to an average temperature, this will not much impair its accuracy.

4. It requires frequent testing, and occasional adjustment. But the adjustments are not difficult to carry out; and the gun sights themselves require testing.

5. It requires a "straight edge" to obtain accurate coincidence; but this need not be long.

The Bar and Stroud instrument is used by the French, and is being tried by Germany. It was used by the Japanese in the late war, and tried towards the end by the Russians.

Other range finders are:—

1. "Marindin." Similar to Barr and Stroud; this instrument costs the same, but is said to be inferior in accuracy and strength.

2. "Cooke." This instrument only costs about £40. But it is constructed on the "Stereoscopic" principle, in which two images, one from each eye, are made to overlap entirely; and this has the disadvantage that the image is blurred.

3. A Belgian instrument, of about the same cost as the "Cooke," and presumably on the same principle.

The Barr and Stroud instrument is at present being investigated by a committee, but their decision is not yet published. But enough has been said to show that it is superior to the present equipment, and very far so; its adoption must depend on its cost, but perhaps, if this is considered too great, an instrument will be found which will give sufficiently accurate results at a less price.

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POINTED BULLETS.

By CAPTAIN J. H. HARDCASTLE, *pac.* (late) R.A.

BY a most wholesome rule of the service, questions relating to small arms are referred to a committee distinct from that which deals with ordnance. For nearly all practical purposes, the problems dealt with by these committees are matters of detail affecting only one branch of the service, and having no reference at all to the advance of natural philosophy. But the subject dealt with in this article, although springing directly out of small arm experiments is an exception, and can be properly discussed in this Journal and should be of interest to artillery officers.

The 1907 meeting at Bisley of the National Rifle Association was made memorable by the abandonment by a special class of shooters of the Metford shape of bullet, and by the adoption of a bullet with a much longer point. The class of competition in which this revolution occurred was the series at ranges from 800 to 1,100 yards in which the use of match rifle is permitted. The match rifle is rather a high-sounding term, and it is generally alluded to by the daily papers as a complicated pseudo-scientific toy fitted with all sorts of paraphernalia in the shape of telescopic sights, &c., and producing results of doubtful utility. A short explanation of the term is, therefore, desirable

The Bisley rules define the match rifle as follows:—

M.R.—match rifles.—50.

Any breech-loading rifle complying with the following conditions:—

Proof marks—when of British make to bear proof marks both on barrel and breech.

Weight of barrel, not including any removable appliances, not to exceed 3¼ lb.

Calibre—maximum ·325.

Pull of trigger—minimum, 4 lb.

Sights—of any description.

A large number of men convert the long service rifle of 0·303 inch calibre into a match rifle by fitting it with magnifying or aperture sights, carrying a spirit level to ensure that they are not canted and provided with screw adjustments for elevation and deflection. For greater steadiness of aim the match rifle is always fired from the back position, the butt in the right armpit and the barrel supported on the inside of the right knee. The ammunition allowed is defined by the following rule 64:—

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M.R.—Any ammunition complying with the following condition:

The cartridge generally must be a serviceable one from a military point of view, and having regard to the weight to be carried by the soldier.

N.B.—Any question arising under this head is to be decided by the Bisley Committee.

A very usual ·303 cartridge has been the Palma 225 grain bullet with a velocity of 2350 fs. and a pressure of about twenty tons on the square inch, and a ballistic co-efficient of 0·44. The target is ten feet wide by six feet high, with a bullseye of three feet diameter, counting five points. A full score at 800 or 900 yards is not very difficult to make, but at 1,000 yards it is rare, and at 1,100 has not yet been obtained. The reason for the difficulty of registering a full score at 1,000 yards lies chiefly in the small imperfections of the barrel and the cartridge. In easy weather the human error may be almost neglected.

From the preceding explanation it will be seen that the new bullet can only have been adopted by the long range men because of its superior accuracy, and the decision to change was not only unprecedently sudden, but was also unanimous. As I myself was very intimately concerned in the matter, it is not easy for me to give a concise narration of the events leading to this surprising result without either suppressing many interesting and necessary details, or else appearing to be writing an autobiography. The latter is, however, forced upon me, but the narration shall be as impersonal as possible.

It will be convenient to divide the subject into five headings:—

1. The resistance of the air.
2. The wind problem.
3. The history of the bullet.
4. The performances of the bullet.
5. Obiter dicta.

(i.) THE RESISTANCE OF THE AIR.

The advantages of the new shape, in practice, are two, although both arise from the same cause. The lengthening of the point is the cause, and its efficiency is derived from the reduction of the resistance of the air. At 2,400 f.s. the resistance of the air to a projectile of one inch calibre with an ogival head of 1½ diameter's radius is 25½ lbs. If the head is of the Metford shape the resistance falls to 20 lbs., but with the new point the resistance is about 14 lbs., or barely half that of the old standard shape used by Bashforth, which is still very common in the projectiles of modern heavy ordnance. In consequence of this reduction the two benefits appear in practice. (i.) The ballistic co-efficient is increased, with all attendant advantages; and (ii.) the wind loses its deviating effect in proportion as the ballistic co-efficient is raised. It is this latter benefit which commends it so strongly to target shots, whereas the former is most useful for military purposes. The accompanying photograph (plate

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1) shews the Metford and the new bullet called "The Swift" side by side, and also shews the rifling marks on each.

The diameter of the fired bullets is 0·311 inch and the lengths are respectively 1·50 and 1·25 inches overall. The length of the rifling marks is 0·65 inch, so that, taking the point to begin where

PLATE I.

the rifling ends, the points are 0·85 and 0·60 inches or 2·75 and 1·93 calibres long. The length (l) of an ogival head of (n) calibres radius is given by the formula

$$l = \tfrac{1}{2}\sqrt{4n-1}$$

so that the Metford head is equivalent in length to an ogival head of four calibres and the Swift head to one of eight calibres. But it is doubtful whether it is correct to take the head of the Swift bullet as only 0·85 inches. The bullet as made is parallel only on the short length below the cannelure. The main curve is struck with an ogive of about ten calibres or three inch radius, and is joined to the parallel by a still more gentle curve, so that, before firing, the point is all that part in front of the cannelure. After firing, measurement is very difficult, but I make the point then to be about one inch long, equivalent to a radius of fourteen calibres. The co-efficient of reduction for use with the Bashforth tables is about 0·78 for the Metford shape and about 0·52 for the Swift, and a consideration of these values leads to the working rule that the resistance of the air varies inversely as the square root of the length of the head measured in calibres. Thus if the ogives are 1½, 4, and 14 calibres radius, the lengths of the head are 1·12, 1·94, and 3·71 calibres. Dividing by 1·12, the length of Bashforth's standard head, and taking the inverse of the square roots of the results, the co-efficients of reduction are 1·0, 0·76 and 0·55 respectively. This formula must not be pressed too hard, but in the absence of direct experimental evidence it is safer than mere guesswork. It is unlikely that any simple percentage rule should be exact, but the percentage is somewhere about 2 to 1 or 3 to 2, i.e. 2% or 1½% increase of length gives 1% decrease of resistance. At any rate this percentage rule disregards the exact shape of the tip of the point or of the fuze or of the armour-piercing cap, and also of the shape of the curve joining the parallel body to the point, about which much has been said and written in the past. The old T. & P. fuze and the newer armour-piercing cap, not to mention the blunt Metford head,

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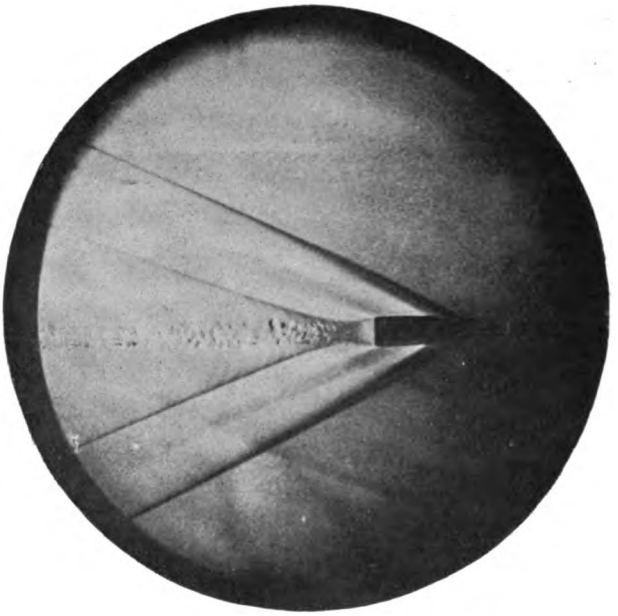
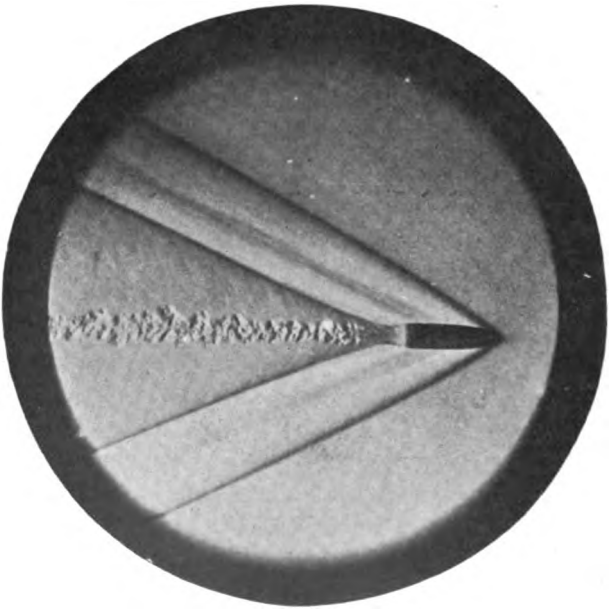


Velocity, 850 m.s.



Velocity, 790 m.s.

PLATE II.

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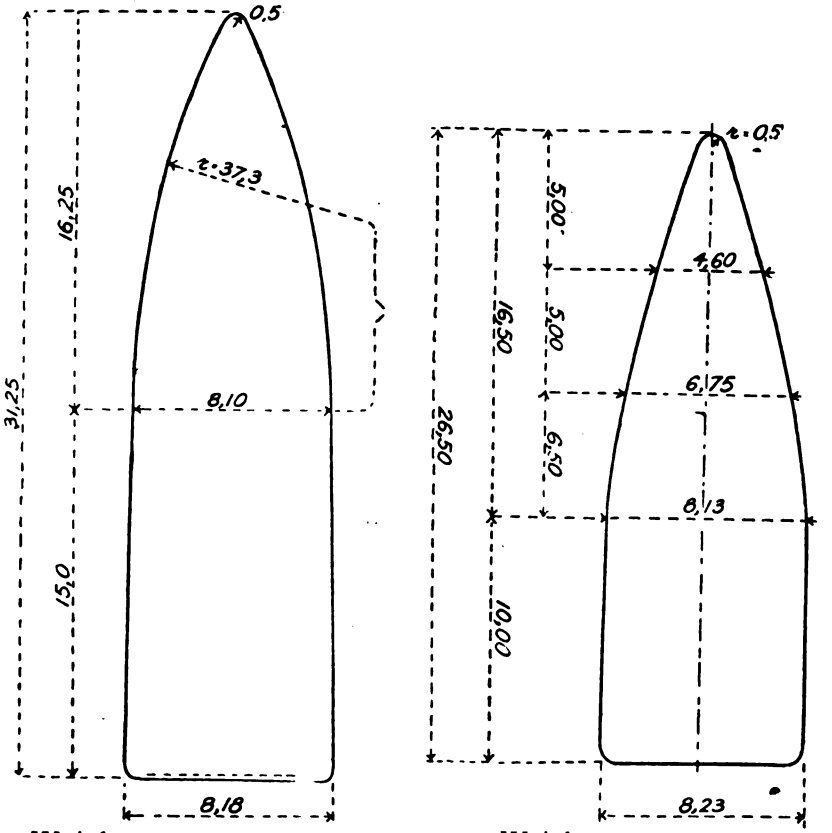
shew that the shape of the tip is not a very important factor in deciding the resistance of the air. As for the shape of the shoulder, in a true ogival head this curve is always circular and its gentleness is a function of the length of the head[1]

By the courtesy of the Chilworth Gunpowder Coy., I am able to reproduce (plate II.) instantaneous shadow photographs of the new bullet in flight. These were taken a year or two ago and are only published now because secrecy is no longer an object. As the velocity of sound is about 1,100 f.s. the velocity of the bullet should be capable



Weight, 13·15 grammes, velocity, 850 m.s.

Weight, 10·3 grammes, velocity, 790 m.s.

PLATE III.

[1] Since writing the above I am handed by the courtesy of J. Rigby & Co., Ltd., Gunmakers, of 72, St. James Street, S.W., the results of their experiments with pointed bullets (8 diameter ogive) in the Mauser Rigby sporting rifle, muzzle velocity 2,900 f.s., calibre 0·257 inch, weight of bullet 139 grains with lead core and nickel envelope, length overall 1·18 inch and radius of tip 0·02 inch. When the tip was filed flat to 0·12 diameter, the observed velocity over 100 yards is reduced 100 f.s. and when the tip is filed so as to make the bullet only 1.0 inch long and 3½ grains lighter, the extra elevation required at 800 yards is 18 minutes and the bullet is more affected by wind.

By the formula just given a head of 8 calibres for this bore is 0·73 inch long and a head 0·55 inch long is of about 5 calibres radius, so that the filing of only 3 grains off the tip seriously affects the ballistic co-efficient and therefore the trajectory.

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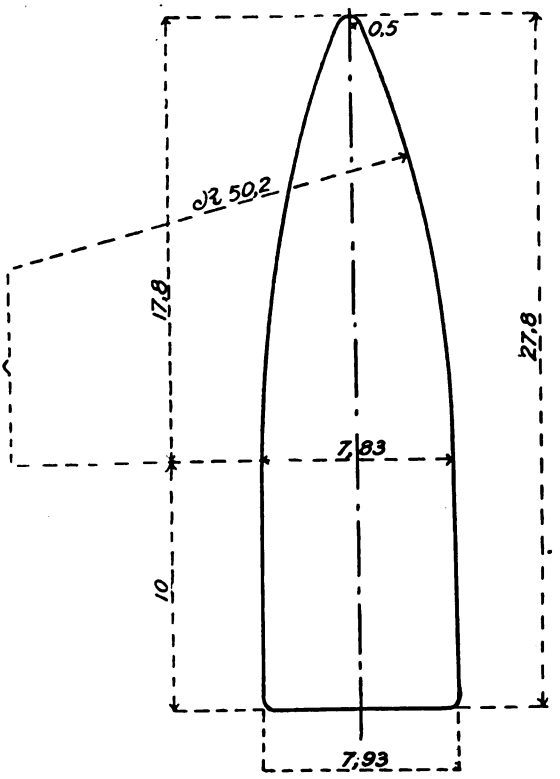

Weight, 10·0 grammes.
PLATE IV.

of determination by measuring the angle of the bow wave, but this is not easy. The angle of the 850 m.s. or 2,800 f.s. photograph is about 26° to the axis of the bullet so that the velocity should be 1,100 f.s. divided by tan 26° = (0·488), say 2,250 f.s., a serious discrepancy caused by the foreshortening of the shadow by the proximity of the spark. These photographs are worth comparing with Boys' photographs, (some of which are in the R.A. Institution), and also with K. D. Doyle's photographs reproduced in Fremantle's " Notes on the Rifle," (Venton 1896).

It will be noticed that there is no disturbance of the air in front of the bullet in these later photographs of higher-velocity bullets, and the shape of the wake eddy is interesting.

Diagrams of the two bullets used in the photographs are shewn in plate III., and on plate IV. is the bullet designed for the 0·303 rifle. The dimensions of these bullets are in metric units, 7·93mm. being 0·312 inches and 10·30 grammes being 159 grains. From the range tables furnished by the Chilworth Coy., it appears that the ballistic co-efficient of their design is between 0·40 and 0·44 for the 154 grain bullet with a velocity of 2,800 f.s. Since W/d^2 is about

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0·235, the co-efficient of reduction must be between 0·5 and 0·6.

Bullets of other makers of the new shape, such as the King's Norton Pointed Palma, Holland & Holland's "Velopex," the French service bullet, and the German "S" bullet, all of which will be referred to later on, have as small co-efficients of reduction as the Swift and the bullets illustrated on plates III. and IV., and I only mention these two because they are the ones I know best.

It is, therefore, evident that our two-diameter ogive shot and shell are now very far indeed from being up to date as their co-efficient of reduction is only about 0·9 as against 0·55 for the new shape.

(ii.) THE WIND PROBLEM.

In his "Cours élémentaire de balistique," (Paris 1859), General Didion published the solution of this problem, so far as the effects of a cross wind on a spherical projectile, which always presents the same cross section to the air resistance, are concerned. About the year 1890, Professor Greenhill, when discussing the graduation of naval sights with the late Captain Younghusband, brought up the subject of wind deflection. He tells me that Younghusband then pointed out the applicability of Didion's method to the solution of the problem in the case of rifled projectiles, which similarly present the same cross section to the air resistance. This adaptation was first published by Professor Greenhill in "The Text Book of Gunnery," (1897 ed.) for cross winds. Whilst I was studying ballistics under him at the Ordnance College in 1902 and 1903, he solved the problem for me, of the effect of a head or a rear wind on the range and we sent the whole solution for deflection and range to "The Journal of the United States Artillery," No. 61, May-June, 1903, in continuation of Greenhill's previous article in the same Journal.

In the last month Professor Greenhill has returned to the subject so far as the effect of wind on range is concerned, and hopes to publish a paper on the subject soon. He is proposing an adaption of the Gâvre formula:

$$\sin 2\phi = \frac{gX}{V^2}\left(1 + \frac{X}{3F}\right)$$

where $F = \frac{H^2}{2g}$, H being the terminal velocity and the other symbols having their usual significance.

By means of certain approximations and transformations, the nature of which I have purposely disguised by further approximations, he then makes:

$$\Delta R = \frac{5}{C}\frac{W}{V} N^2 \text{ yards,}$$

where ΔR is the change of range in yards due to a wind of W f.s. acting on a projectile whose ballistic co-efficient is C and whose muzzle velocity is V f.s. fired at a range of N hundreds of yards.

For cross winds Didion's solution gives the lateral deviation (S) in feet by the formula

$$S = W\ (T - t)$$

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where "T" is the time of flight in seconds and t is the time of flight over the range R yards if the muzzle velocity (V) is maintained throughout the trajectory, as is the case in a vacuum. So that in Didion's words "S" increases with "the speed of the wind" and "is measured by the increase in the time of flight in air, compared with the time of flight in a vacuum."

It will be noticed that Didion's dimensions are correct because time multiplied by velocity is space.

In actual shooting it is desirable to use a formula with the deflection in minutes (θ) and the wind speed in miles/hour (M) as arguments. Such an one is given by the formula first published in "The Journal of the United States Artillery," No. 61.

$$\theta = \frac{M \times N}{C} \times \frac{\overline{K}}{1320}$$

where "$\overline{K}$" is the average value over the trajectory of the "K" defined on page 303 of "Text Book of Gunnery," 1902.

(An average velocity of "$\overline{K}$" is 90).

When N = 10 and M = 10 the following table results:—

	Service bullet.	190 grain Swift.	225 grain Swift bullet.
C	0·42	0·54	0·66
θ	16·0	12·5	10·2

This does not quite express the effect of increasing the value of "C" because "K" continually diminishes as "V" increases beyond 1,400 f.s. and also because the flatter the trajectory the less the bullet rises into the truly windswept regions. Near the surface of the earth especially from 0 to 30 foot altitude, the power of the wind in much diminished and every foot of height in trajectory counts in the effect of a particular breeze. Although the theoretical diminution of deflection at 1,000 yards is only 16 to 10 in favour of the Swift bullet, in practice owing to the friction of the earth's surface damping the velocity of the wind, this diminution may be as much as 16 to 8 and observation of the correspondence between theory and practice will be proportionally handicapped, because the flags on a range

Name of Gun.	Calibre.	Muzzle Velocity.	Weight of bullet, grains.	Ballistic co-efficient.	Time of flight, 1000 yards.	Delay over 1000 yards.	Deflection at 1000 yds. for 10 m.h. wind.
Gibbs	0·461	1320	540	0·64	2·96	0·69	11½ mins.
Martini Henry	0·450	1320	480	0·40	3·29	1·02	17 ,,
Lee Metford ...	0·303	2060	215	0·42	2·41	0·95	16 ,,
Mannlicher	0·256	2350	156	0·38	2·28	1·00	17 ,,
·303 Swift or "P.P."	0·303	2360	225	0·67	1·77	0·50	8½ ,,
Velopex	0·303	2900	150	0·42	1·79	0·76	13 ,,
Lee Metford Palma	0·303	2350	225	0·44	2·13	0·85	14 ,,
Q.F. Mk. IX. ...	6·0	2500	100 lbs.	3·0	1·36	0·16	2½ ,,

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are always set up at an excessive height for the average height of the trajectory. The flag poles on the long ranges at Bisley are about forty feet high and the "Swift" bullets do not rise 15 feet in a thousand yard trajectory.

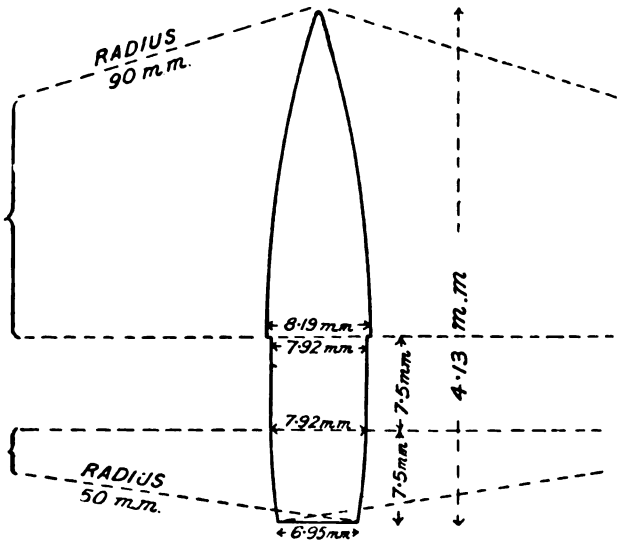
The preceding table gives the particulars of eight different guns, seven of them being rifles and one being ordnance, and shows the calculated deflections due to a wind of 10 miles an hour, at 1,000 yards.

Such a wind speed would be pleasant on a fine day, and would enable racing yachts to carry full canvas and would not interfere with any outdoor sport, although it would go near to it on an unsheltered ground. The deflections for the rifles agree very well with the experience of match rifle men who have used these guns, and the deflection for the 6-inch gun is such as is generally used.

Taking "K" as 90 on the average, the delay follows the theoretical formula with sufficient exactness for practical purposes, and shows that the wind deflection decreases as the ballistic co-efficient increases.

(iii.) THE HISTORY OF THE BULLET.

The history of the new shape of bullet is interesting, and through the kindness of Kynoch Ltd., The King's Norton Co., Messrs. Holland & Holland and others, and especially of the Chilworth Gunpowder Co., Ltd., who were the first to move in England in the matter of a pointed bullet, I have been able to ascertain it with sufficient accuracy. Before Whitworth's and Bashforth's publications several people had devoted time to experiment with various projectiles, and even had tried bullets made with ogival heads of ten or more calibres radius. Some of these projectiles, notably General Jacob's,



French Bullet. PLATE V. Scale about 5 to 3.

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Sir Wentworth Dilke's and Count Stuart's gave satisfactory results, but none of these pioneers ascertained quantitatively the resistance of the air or left any record behind them of the variation in the effect of the wind on the trajectories. The interest of their experiments is purely archæological, as they "lived before their time." Between 1865 and 1880, Bashforth shewed that the shape of the head seriously affected the resistance of the air, and Krupp has been working at the problem ever since. Ingalls' tables are based on his results, Mayevski, Siacci and Zaboudski contributing to the analysis of the experimental data. Quite at the end of the last century the French seriously tackled the question of the best shape of projectile, and have adopted a solid bronze bullet, 90% of copper and 10% of zinc for their service rifle. Plate 5 shews the dimensions of this bullet.

Unfortunately I have not the proper particulars to obtain its ballistic co-efficient, but it should be about 0·6 and its muzzle velocity would be in the region of 2,400 f.s., making it an excellent military projectile.

It will be noticed that this bullet has a small shoulder which not only takes the cartridge case but also by taking the gas pressure, "sets up" the bullet. People who have seen the fired bullets tell me that despite this shoulder and the narrowing of the base, the recovered bullet is parallel where the rifling marks occur.

About 1901 the German Government and the Deutsche Waffen und Munition Fabrik, Berlin, began experimenting on the same lines independently of one another and produced in or before 1904 the so-called "S" bullet weighing 154 grains for their 7·9 mm. Mauser rifle. The muzzle velocity is about 2,850 f.s., and the ballistic co-efficient is about 0·44.

The experiments for the Deutsche Waffen Co., were, I understand, carried out at the "Centralstelle für wissenshaftlichtechnische Untersuchungen" on their range at Königswusterhausen,, where a delightfully complete installation of scientific instruments exists for the use of subscribers, such as has no counterpart in England, and is much to be desired.

Particulars of this bullet's trajectory were given in "The Journal of the Royal Artillery," February, 1906, and The Field" on December 2nd and 16th, 1905, devoted articles to it. The first publication of the effect of the new shape was an article in "Kreigtechnische Zeitschrift," in the autumn of 1905. When I read this article and examined the figures, I perceived that either a deliberate hoax had been perpetrated or else that something new and of the utmost importance had been discovered, and I reported accordingly, mentally deciding to get direct experimental evidence before taking action. In 1906, several firms in England experimented with the new shape but in secret. As a result the King's Norton Co. designed a bullet almost exactly like the "Swift" bullet, (plate 1), and with it Colonel Fremantle actually won a very good prize at Bisley in July, 1906, with an excellent diagram using a bullet of 168 grains in a ·303 rifle with a velocity of about 2,500 f.s.

For the reason that the work they were doing with these bullets

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was in connection with the open competitive trials which were being carried out by the War Office, the Company naturally did not invite publicity, and kept the result to themselves. But they tell me that at this time, not only were bullets with compound cores, fore and aft, tried, but also bronze and brass bullets of the new pointed shape. Their pointed Palma ammunition has been used this year at Bisley with success, but they did not bring it out publicly, until after the "Swift" had made its success.

Until the "Swift" was brought out, the King's Norton Co. were however, in the happy position of holding a practical monopoly in the supply of fine shooting cartridges for the ·303 rifle, having made their reputation in 1903, by supplying the cartridges for the Palma trophy match, and having followed it up by supplying M.D.S. cordite and also wax lubrication in their subsequent issues. With reference to this latter as it is of interest to gunners, I quote the exact figures as supplied:—

Bullet weight, grains.	Velocity lubricated, f.s.	Velocity unlubricated f.s.
215	2302	2229
225	2254	2206

The metallic fouling was also less when the bullets were waxed.

To their energy also must be credited the disappearance of the Mannlicher rifle and cartridge from the winning lists at Bisley and the general adoption for match rifle work of English rifles and cartridges.

In 1901, the Chilworth Coy. informed the War Office of the movement which was taking place on the Continent in the direction of using pointed bullets and high velocity ammunition, and in March, 1904, they offered to supply pointed bullets of 195 grains with service pressures for the Lee Metford Rifle.

In September, 1905, they offered the 154 grain bullet with nickel plated steel envelope, shewn on plate IV., for trial, but I do not know the result. As regards priority at the War Office, this Company must be given all credit for trying to bring out ammunition up to date.

At the end of 1906, Holland & Holland got out the "Velopex" bullet of 151 grains shewn on plate VI.

PLATE VI.

They tell me that this has a velocity of 2,900 f.s. with C = 0·44. It is eminently suited for sporting rifles, having a composite core, the base being lead and the nose being aluminium or wood, in either case with the usual cupro-nickel envelope. In connection with this design of bullet there is one claim which should not pass without careful examination. The makers claim that the lengthening of the

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point has a distinct effect upon the accuracy, and in substantiation they quote the results reported in "The Field," January 18, 1907, for their 0·465 Express Rifle.

The bullet used was a 365 grain "Velopex" with 75 grains of cordite behind it, giving a velocity of 2,282 f.s. and a pressure of 10·71 tons per square inch, and it was compared with a 480 grain soft nose bullet of the same calibre with the same charge of cordite, producing a velocity of 2,141 f.s. with a pressure of 12·14 tons. The "Velopex" diagram at 100 yards is very fine, in fact it is a record, all seven shots being on a postage stamp. The contour of the bullets is, however, nearly the Martini Henry contour, so that the trade mark "Velopex" only refers to the wood nose, and only affects the exterior ballistics by placing the centre of gravity well back from the centre of figure. This in itself is a very old device, and in every case when *strict* comparative trials have been carried out, has failed to shew any decided advantage. It is much more probable that the accuracy of the "Velopex" design is due to considerations of interior ballistics. I mean that a change of pressure, and of "time up the barrel" producing a change of phase of vibration of the barrel at the moment of exit of the bullet, is far more likely to affect the accuracy than any change of balance of the bullet. Any way it was shot at Bisley with some success by a tyro, and I refer to it again.

On the 20th February, 1904, in Germany, the Deutsche Waffen Co. registered their patent for pointed bullets, and its English number was 3429/1905 of 18th February, 1905, which is a proof that the patentees were hard at work on the right lines four years ago.

In the summer of 1906, it was not generally known in England that the new shape of bullet with its long point was really as good as was claimed. The patent just referred to was indifferently translated, and without experimenting "ad hoc" it was impossible to check the claim for superior "bullet power" implied in the 1905 article in "Kriegstechnische Zeitschrift."

But to every serious student of the science of exterior ballistics it was plain that, provided the claim was true, the wind deflection was involved, and also that the claim was capable of verification by "ad hoc" experiment. This is the place where my autobiography comes in. Thanks to my studies under Professor Greenhill I was perfectly aware of the true nature of the wind problem. I was also aware that in target shooting, deflection was a more important error than elevation, and because I had plant at my disposal I was able to check the German claim of superior ballistics consequent on improved shape.

I had also been working for the Ordnance Committee for two years on the determination of the resistance of the air, so that I had every advantage ready to my hand in the shape of education and experience and appliances.

In designing the "Swift" bullet, I only had to select the heaviest bullet and the best shape that could be fired from the ·303 rifle with a pressure of about twenty tons with a fair vertical accuracy.

If the bullet and cartridge departments could produce the desired accuracy of work, it could not but be that the results on the

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1,000 yard target would be better than usual, and the stronger the wind, the greater the superiority of the pointed bullet must be. I have been asked pointedly in the correspondence columns of the "Times" to explain what it was that I designed, and my questioner did not seem able to grasp my explanation; but now I hope that the simplicity of the matter will be apparent to my readers.

I took the heaviest bullet used in the ·303 and put onto it the best point that I could hear of, and used the heaviest pressure that was safe. By so doing I got the shortest "time up the barrel" and the greatest ballistic co-efficient, and so obtained the greatest vertical accuracy by considering the vibrations, and the greatest horizontal accuracy by eliminating the wind deviation as much as possible. That my reasoning was correct is proved by the result.

(iv.) THE PERFORMANCE OF THE BULLET.

From German and American reports this bullet seems to have done fairly well in the shooting seasons of 1905 and 1906, but owing to the limited ranges at which it was shot, not exceeding 500 yards, it had no chance of making a sensation.

It was shot up to 2,000 metres in Germany in 1905, but from a fixed rest, and that is a very poor test of a gun meant to be shot from a human shoulder. The weight clamped to the barrel affects the vibration of the barrel in a very marked fashion, and the mere fact of utilising a mechanical contrivance to ensure a certain amount of accuracy deprives the users of the full display of their wits. The men in charge are apt to consider the rest to be an instrument free from any error, when in fact it is capable of making very large errors, and for very small causes.

On the 29th May, 1907, the "Swift" bullet was shot in public competition for money prizes in the English Eight Club Meeting at Bisley, and took first prize with a score of 135 out of 150 at 800, 900 and 1,000 yards in a very strong right wind. The next best score was 129, and the first place was won by a "tyro," shooting against many of the best men in England. This performance encouraged several men to shoot it in the Scottish Meeting, and Mr. Caldwell set up a world's record with it, making 223 out of 225 points at the same ranges. In the Irish Eight Meeting there was a very fierce wind and the bullet behaved as the designer expected and won easily, so that, when the Cambridge Cup was shot for at the end of June, half the competitors were using it. When it was known that it had won that most difficult competition, the fate of the ordinary Metford bullet was practically sealed.

The scoring at Bisley this year was rather higher on the average than usual, but this advance might have been a coincidence and due to some peculiarity of the weather, if it had not been capable of prophecy from theoretical considerations. Mr. Maurice Blood actually won the King's Norton unlimited entry Aggregate with a full score, making a full score twice at 900 yards, (10 shots each), twice at 1,000 yards (7 shots each), and again twice at 1,000 yards (10 shots each), and also making a run of 23 consecutive bullseyes at 1,000 yards

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duly certified by the range officer; and then again runs of 31 and 32 consecutively, of which latter two I have not actually seen the verification.

When the Bisley meeting opened on July 8th, the extraordinary spectacle was seen, that a bullet which had not been before the public for a month had ousted the design which had been used for more than 20 years. Such an occurrence is worthy of the most serious attention of artillery officers.

(v.) OBITER DICTA.

The penetration of this new shape of bullet into steel gun shields has been ascertained by the Chilworth Coy. in comparison with the service bullet, using the bullet (plate IV.) of 154 grains, with muzzle velocity of 2,800 f.s., and nickle plated steel envelope.

The following table shews the result:—

Plate, thickness in m.m.	Service bullet, penetration at yards.	Plate IV. bullet, penetration at yards.
6·04	nil.	105
5·19	nil.	135
4·32	75	275
3·07	235	500

The King's Norton Coy. tried their pointed Palma into soap bars, two inches square and fourteen inches long, plate VII. shews the result when the point had been filed so as to just expose the lead.

PLATE VII.

The Velopex bullet would give very similar results in soap without filing the point, but its penetration of steel plate is not likely to be great; I have, however, no figures to quote.

The "jump" of the service rifle and bullet is about 10 minutes negative, but the jump of the Swift or Palma is distinctly different and is nearly zero. In consequence at 500 and 600 yards the same sighting will do for the Swift as for the service cartridge. At 200

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yards the Swift wants a higher sight and at 800 yards and over it wants a very much lower sight than the service ammunition.

None of the 225 grain pointed bullets will load into the magazine of the service rifle when using a charger as they are about an eighth of an inch too long, but they work correctly for single loading, either into the magazine or into the chamber.

The "fixed sight" range, i.e. the range when the greatest height of trajectory does not exceed 6 feet, of all the pointed bullets, whatever their velocity, is about 700 yards, and for this reason I described the Velopex ·303 cartridge as an excellent sporting cartridge and said nothing of its military usefulness. A new cartridge to take the place of our Mark VI., ·303 cartridge must comply with certain conditions.

1. Its pressure must not exceed 20 tons.
2. Its fixed sight range must be greater.
3. Its accuracy must be as good or better.
4. Its exterior dimensions must be the same so as to load into the same chamber.
5. It must have as many other advantages as possible, viz:—better penetration, stopping power and long range effect.

The Swift and Pointed Palma comply with all except (4), and the Velopex complies with all except (5).

By combining these two types and adopting a pointed bullet of the same dimensions as the Velopex bullet, but with a solid lead core we ought to get all the advantages possible.

To comply with (1) using a 20 ton pressure

$$V \text{ must be } 5050 - 180\sqrt{W} \text{ nearly,}$$

where V is the muzzle velocity in f.s.

and W is the weight of bullet in grains,

and this relation expresses very fairly the results of the latest experiments with the ·303.

Since the greatest height of a trajectory is four times the square of the time of flight, the time of flight for the fixed sight range is 1·225 seconds. In a flat trajectory the general expression for the time of flight is

$$T = \frac{3R}{V} + \frac{1}{2}\frac{\bar{K}}{C \times 10^9}(3R)^2$$

where $\bar{K}$ is the average value of Bashforth's co-efficient K and may be taken as 70 for high velocities.

In the case of the ·303 and pointed bullets taking the diameter as 0·307 and the co-efficient of reduction as 0·548

$$W = 361\ C$$

$$\text{whence } C = \left(\frac{5050 - V}{3420}\right)^2$$

To evaluate the fixed sight range for various weights of pointed bullets we must substitute the known values in the general expression for the time of flight and so obtain

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$$R = \sqrt{0{\cdot}334\,(5050-V)^2 + \left\{\frac{(5050-V)^2}{2{\cdot}436\,V}\right\}^2} - \frac{(5050-V)^2}{2{\cdot}436\,V}.$$

Solving for R we get

V	2000	2350	2635	2845	3000	3300
R	690	740	757	751	742	700

giving a maximum fixed sight range when the muzzle velocity is about 2,600 f.s.[1].

This is quite contrary to general opinion. At first thought any one would suppose that the higher the muzzle velocity the flatter would the trajectory be, and this is so if the bullet is unchanged and the pressure can be increased at pleasure. But the practical limit is the pressure, and when this is taken into consideration the apparent anomaly just described results, and it so happens that the heaviest possible bullet of the same length for the new pointed shape gives the longest fixed sight range when the fixed sight range is settled as producing a six foot trajectory,—but not otherwise.

Checking the results by the "S" and "T" tables, the 2845 f.s. velocity has an advantage, instead of a disadvantage, of about five yards in the fixed sight range, but this is of no practical importance, when compared with the advantage in striking velocity, striking energy, penetration and long range effect.

[1] If a new powder is invented which with the same pressure is able to give the 215 grain ·303 bullet a higher velocity than Cordite, some alteration in the constants in the equation for R will be required, but the argument will not be affected.

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"DUNCAN" COMMENDED ESSAY, 1907.*

"To what extent may guns and howitzers of greater calibre than those of our Field Artillery co-operate usefully in field operations, and what rules should govern their tactical employment?"

By MAJOR T. B. WOOD, R.G.A.

"VERBUM SATIS SAPIENTI."

INTRODUCTION.

IN our Thesis, co-operation in field operations is apparently distinguished from tactical employment, but it is not clear how they can be separated in dealing with the subject.

By co-operation, tactical co-operation is presumably meant, and the aim of every rule of tactical employment is to ensure the closest co-operation between the three arms. Consequently, tactical co-operation and tactical employment may be considered as synonymous terms.

That heavy artillery[1] can co-operate to a very large extent in field operations is evident to the most superficial student of military history—the South African War and the recent campaign in Manchuria offering numerous examples of heavy artillery being employed as far to the front as field artillery—the question, however, of how far they were *usefully* employed, and how far can they be *usefully* employed in future, is most difficult to answer, because it involves an investigation into the causes which contributed to success or failure; and then, an apportioning of the measure of credit due to each arm—an invidious as well as an almost impossible task, and about which there must be the most conflicting opinions.

The battle of the Yalu may be cited as an example of this confliction of ideas. German authorities claim that the Japanese success was largely due to the employment of twenty 12 cm. howitzers—an idea which is scouted by almost all French and Swiss writers.

It is not easy to define the scope of the term "useful co-operation" since an inferior ranging field gun that was not a quick-firer, and was without shields and without common or lyddite shell, would doubtless find the co-operation of heavy guns most useful, whereas a Q.F. shielded field gun ranging to 6,000 yards assisted by a light field howitzer (5-inch or 4·7-inch) might require little or no assistance from the heavier natures of ordnance.

* The three Commended Essays were not placed in order of merit by the Judges nor are they published in any particular order save as expediency suggests.—Secretary, R.A.I.

[1] The term "heavy artillery," throughout this Essay is intended to include guns and howitzers of a heavier calibre than those at present in use with our field artillery.

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The conditions to be borne in mind so far as we are concerned are:—

That we have, or shall have, a Q.F. shielded gun ranging up to 6,200 yards.

That we have the 5-inch howitzer ranging up to 6,000 yards; and that, in the near future, we may have a 4·7-inch quick-firing howitzer such as is now being experimented with, by at least one foreign nation.

Therefore the useful co-operation of heavy artillery in field operations, is limited to such tasks as cannot be economically and efficiently performed by both the above weapons acting in conjunction.

Further considerations are set forth under the following headings:—

A. General tactical considerations.
B. Defensive tactics:—
  (1). The occupation of a position.
  (2). Rear guards.
  (3). River crossings.
  (4). Posts on the lines of communication.
C. Offensive tactics:—
  (1). Attack of a position and pursuit.
  (2). Advance guards.
  (3). River crossings.
  (4). Raids.
D. Probable Theatre of War of our future operations.
E. Concluding remarks.

A. GENERAL TACTICAL CONSIDERATIONS.

The principles of tactics, as of strategy, are immutable, but the method of applying these principles changes from year to year, and it is the true appreciation of these changes and the correct application of the principles to prevailing conditions which decides the fate of armies and of nations.

It is as correct to-day, as in ancient days, to say that the application of overpowering strength at the decisive point will ensure victory; but it is manifestly incorrect to assume that the mode of application of the force has not changed. This will, perhaps, be better illustrated by examples from comparatively modern days.

At Austerlitz Napoleon realised from a personal reconnaissance that the decisive point would be the Heights of Pratzen; he therefore disposed his troops so as to be able to throw an overpowering force against that point. Further, he himself personally directed the movement.

Salamanca was fought under very similar circumstances. General Lord Wellington saw that his opponent had committed a tactical blunder in weakening his centre and allowing his wings to attack outside supporting distance. He therefore personally directed the bulk of the English forces against the French centre, which was broken, and an English victory resulted.

In both these examples the tactical situation was appreciated by

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the commander as a result of his own individual reconnaissance, and he personally was able to set the victorious troops in motion.

Compare these conditions with those that obtain to-day; when it is possible for a soldier to take part in the firing line in a fierce engagement, and not even see an opponent nor even locate the hostile position; and it will be readily conceded that it is most misleading to attempt to draw lessons in tactics from any but the most recent wars.

Now this change, which is so fundamental in character as to almost obscure original principles, is due entirely to the development of matériel. Railways, telegraphs, telephones, steam and motor transport, breech-loading rifles and guns, telescopes, have all been developed and adapted to the requirements of war until it has become almost a truism that "matériel governs tactics." This being so, it is self-evident that a correct evaluation and application of matériel becomes of paramount importance.

A modern army is chained to its lines of communication as much by the necessity for replenishing its ammunition, as by the requirements of food supply; in certain cases the ammunition supply is of greater importance, because food may be found in the theatre of operations, ammunition never. The means of transport are never in excess of the demand, seldom equal to it—any waste of power then, such as allotting to heavy artillery a task which can be carried out by field artillery, must be sedulously avoided.

Further, it must be borne in mind that heavy artillery is more expensive to maintain and equip than field artillery, and as it may often happen that the resources of a state are strained to their utmost limit to bring a war to a successful conclusion, it is of importance that no money should be wasted in unnecessary expenditure.

THE SOUTH AFRICAN WAR.

The South African War was the first important campaign in which smokeless power was used, and as might be expected, many new and important lessons in tactics were learnt. Before this war there had been little, if any, independent thought in England on the probable effect of the new explosive. We had been content to follow the ideas of our German neighbours, still under the influence of the 1870-71 campaign, and we consequently had a somewhat rude awakening.

In the attack wide extensions were found to be essential to avoid heavy losses, and for the same reason, frontal attacks were abandoned. By many indeed it was maintained that frontal attacks would never again be successful in the face of modern weapons, but this opinion has not been confirmed by recent experience in Manchuria, and it is generally conceded now, that this opinion was based on unreliable data. The advance against an enemy in position had to be slow and methodical, every advantage being taken of cover, which in many cases had to be improvised.

The impossibility of locating the enemy's trenches, or even the direction whence the fire came was brought vividly home to all.

A pitched battle, it was thought, between European armies, would resemble a siege—the attacker being forced to occupy successive positions which would be entrenched. The approach to these

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positions being carried out either under cover of darkness or by dribbling men forward under cover of a heavy fire from the rear.

So far as the artillery is concerned and it is with them that we are more immediately concerned, perhaps, the most important lessons were (a), the futility of the preliminary bombardment, (b), the disappearance of the time-honoured artillery duel, and (c), the advent of heavy mobile artillery in field operations.

The engagements at Magersfontein and Colenso, are notable examples of the hostile position being subjected to a preliminary bombardment, the effects of which were shown by after events to have been "nil." Then came the question of the artillery duel.

The Boer guns were generally well concealed; if over-matched they ceased firing temporarily, coming into action later when the infantry advance commenced. If our artillery again engaged them the hostile infantry were able to devote themselves unmolested to our advancing infantry, and the advance was checked.

Quick to grasp the true meaning of the lesson, the artillery leaders realised that it is the infantry and the infantry only who win battles, and it is for the other arms to co-operate. It was for the artillery to devote themselves entirely to the assistance of the infantry. To attract if necessary the hostile artillery fire on themselves and to pour such a heavy and accurate shrapnel fire on to the hostile trenches as to prevent the defenders firing.

The third lesson mentioned, the appearance of heavy mobile artillery attracted at the time considerable public attention, possibly, more than it deserved.

At the commencement of a campaign, the unexpected discovery that the enemy possesses heavier and longer ranging guns has considerable "moral" effect. The soldier ever prone to take council with his fears sees himself in imagination shot down at ranges beyond those at which he can reply; his confidence is rudely shaken, he has been taught to regard the artillery as equal to any in the world. Yet here, at the commencement, it fails. Other things he has been taught he thinks perhaps are wrong. The unbridled Press make the most of the opportunity to criticise military methods without any tactical knowledge whatever, with the result, that unimportant events often acquire undesirable prominence.

The physical, as opposed to "moral," effect of the heavy artillery of the Boers was not great, and, as far as we can judge from reports received from Boer sources, the shrapnel fire of our field artillery in all the larger engagements was more feared and did far greater execution than the fire of any heavy artillery.

During the latter phases of the war heavy guns in sections or even as single guns were much used, their longer range and high shell power giving them a value far in excess of an equal number of field guns, whilst they were found to be quite capable of marching with infantry under almost all circumstances. The difficulties of their ammunition supply were obviated by the short duration of engagements, and by the number of dépôts throughout the country where their supply of ammunition could be replenished.

These latter operations however, partook essentially of the nature of guerilla warfare, and conclusions based on them must be received

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with great caution. Our opponents were almost without artillery and showed considerable lack of enterprise. The inherent difficulties inseparable from the use of heavy artillery such as the choice of a covered position, movements on the field of battle, organisation in brigades, and the transport of the heavy ammunition, were never thoroughly tested.

Entrenchments were largely used by both sides but in no case were they materially damaged by heavy shell. Isolated cases occurred where a portion of a trench was demolished by the lucky fall of a high explosive shell, but the actual effect on the engagement could have been but trivial, and not to be compared with that produced by a rapid and accurate fire of shrapnel.

Many instances can be quoted where the fire of one or more hostile guns of large calibre entailed considerable delay in our advance, but this was more often due to a feeling of surprise amounting almost to consternation at finding ourselves opposed by such weapons, than to their material effect, which was insignificant and in no case decisive.

The terrain in South Africa is pre-eminently suitable for the movement of heavy artillery. There is no cultivation, the fences are constructed of wire, and easily removed, and the virgin pasture and Karoo found in almost all parts offers a smooth hard surface for the passage of the heaviest guns. There is no lack of good artillery positions from which owing to the configuration of the ground the clear atmosphere and bright sunshine, an extensive view is generally obtained in all directions. Observation of fire is therefore comparatively easy even at the longest ranges.

Our opponents were "irregular" and ill-disciplined, and as such, particularly sensitive about their flanks and line of retreat. They seldom offered an obstinate defence and their artillery tactics were faulty in the extreme. These traits in conjunction with the desire on our part to minimise losses were responsible for the often unnecessarily long ranges at which artillery fire was opened.

Instead of our field artillery pressing forward to effective range before opening fire, we adopted our opponents' tactics, introduced heavy guns and attempted to hold them to their positions by long range artillery fire, whilst wide turning movements were made against their flanks and rear.

These faults would possibly have been avoided had the country been less suitable for long range fire and our opponents better trained as soldiers.

THE MANCHURIAN CAMPAIGN.

Trained after the German model it was interesting to see the Japanese committing the same initial blunders, in their earlier engagements, of which we had been guilty, and attempting to push forward infantry in dense lines against unshaken troops. In the latter phases of the campaign, however, this was rectified.

Speaking generally, the lessons of the South African War were accentuated with one or two notable exceptions, the most important of which were (a) the manner in which frontal attacks were often successfully carried out in the face of severe opposition, (b) the frequent use

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which was made of the bayonet, and (c) the obstinate fights for localities.

Many reasons have been deduced to show that the first two quoted were phenomenal, and unlikely to be repeated in future conflicts, but where one belligerent (as in the case of the Russians), has been taught to rely on the bayonet and is insufficiently trained in fire tactics, is opposed to a foe imbued with such a patriotic and self-sacrificing ardour as were the Japanese, it is probable that similar examples will occur.

The obstinate fights for localities were a most noticeable feature. From the commencement the Russians adopted a defensive attitude, the only exceptions perhaps being the advance of Lieut.-General Stackelberg to Telissu, and the abortive attack of General Kuropatkin in the early days of September, 1904.

This defensive attitude was mainly brought about by two causes, firstly, the inclination and training of the Russians in favour of defence, and secondly, their unpreparedness for war at the time when it broke out. This is markedly demonstrated by Lieut. General Stackelberg fortifying several positions on which to fall back in case of defeat, whilst actually advancing southwards to the relief of Port Arthur.

Having adopted this almost passive defensive attitude, partly through inclination, and partly from force of circumstances, the Russians spared no pains to fortify their positions, which at Mukden and Liao-Yang, were strengthened by some permanent works of very strong profile.

A detailed description of the attack of these works by the Japanese heavy artillery would have been of great value, but unfortunately only the most meagre accounts have so far been received. We know approximately the number of heavy guns the Japanese employed, but of their fire tactics or details of their effect we are as yet ignorant.

Villages when in the position were always strongly occupied by the Russians and prepared for defence, and they were often the scene of most fierce engagements.

A thorough reconnaissance of the hostile position was the first care of the Japanese, then as the infantry was pushed forward every available gun of the attack was devoted to covering them and keeping down the hostile fire. When unable to press further forward the attacking infantry entrenched themselves, the entrenchments being improved and strengthened by the on-coming supports and reserves. A further advance was made under cover of darkness, or as opportunities offered during daylight, it being understood by all that each successive position must be held at all costs.

At the moment of assault, batteries of field artillery were pushed forward to within one thousand or twelve hundred yards of the hostile position, whilst other batteries, from positions in rear, opened a rapid fire at the point selected for assault, increasing their fuzes and range as the attacking infantry entered the position. On the 3rd September, 1904, General Oku, used his 15 c.m. howitzers, which had been brought up on trucks, to cover the advance of his field artillery to within 1,200 metres of the Russian lines.

The losses of the Japanese infantry making the frontal attacks

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were enormous, in many cases it was impossible to maintain reserves as all the troops were required to fill gaps in the firing line.

More extensive fronts were occupied than had ever been contemplated at the close of the South African war. On the 27th February, 1905, the Japanese front extended from Hsin-Min-Ton via Chang-Tan-Sha-Ho-Pu and Chang-Chi-Sai to Tita on the Hunho a distance of considerably over 90 miles.

Battles lasted for many days—Liao-Yang from the 25th August, to the 3rd September,—Mukden from the 22nd February, to the 10th March, and were mostly devoid of great results. Pursuit if attempted was unsuccessful, and for this there were many reasons. The exhaustion of the attackers owing to the duration of the combats; the extent of front occupied; the lack of fresh troops; the stubborn tenacious courage of the Russians, who though defeated, were never demoralised; the retaining power of modern weapons; and possibly, the lack of good cavalry by the victors.

As regards artillery tactics, the necessity for cover, either natural or artificial, was demonstrated in the most remarkable degree. In the first important engagement at the crossing of the Yalu on the 1st May, 1904, the Russian artillery were provided with scarcely any cover and were quite visible. At the battle of Vafangou, six weeks later, the artillery on both sides occupied covered positions using indirect fire, and one of the greatest difficulties experienced was that of locating the hostile artillery; as both sides made extraordinary efforts to keep their position concealed. Many examples occurred, notably on the Shaho, of the position of the Russian batteries being undiscovered for days, and of their consequent entire immunity from loss,—though taking an active and in some cases almost decisive part in the fighting. Once the position of a battery became definitely known, it was quickly silenced or forced to move.

The Japanese field gun was inferior to the Russian and on occasions this entailed heavy losses to the Japanese infantry which could not be effectively supported. As the country however, did not offer the same facilities as South Africa for correct observation of fire, the ranges were seldom excessive, varying from 3,500 to 5,000 yards, and this obviated, in a manner, the inferiority of the shorter ranging Japanese gun.

There were few counter-attacks made by the Russians, partly due to their lack of initiative and partly due to their utilising their fortifications, not as pivots on which to base their offensive movements but rather as "réduits," to be defended to the last.

At the commencement of the campaign the Japanese had no heavy artillery, with the exception of the twenty 15 c.m. howitzers, used at the battle of the Yalu. At the end of the campaign, at the battle of Mukden, they had 168 heavy guns in action. The Russians had also improvised a number of howitzer and mortar batteries. Yet none of the accounts, so far received, from either Japanese or Russian sources, claim that the effect of this heavy artillery was decisive. At the battle of the Yalu, against 15,000 Russians with 46 guns, the Japanese deployed 54,000 men and 258 guns. The twenty 15 c.m. howitzers were therefore hardly needed to secure the victory.

The semi-permanent works covering Mukden to the south were no

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doubt attacked by a large proportion of the Japanese heavy artillery, yet they suffered little material damage, and in no case, were they evacuated by their garrisons as a result of this fire, but were only abandoned when the Japanese turning movement from the west forced the Russian army to withdraw northwards. Similarly in the other engagements of which we have received detailed accounts the damage to *matériel* by artillery fire was everywhere insignificant.

On the Shaho the Japanese directed a very heavy fire of heavy artillery against the Russian centre between Cha-Ho-Po and the Poutiliff Hill, making use of some 28 c.m. howitzers. The bombardment was quite ineffectual against the Russian trenches and all the Japanese infantry attacks were successfully repulsed. Nor was the "moral" effect of these heavy artillery projectiles very great. Capt. Solovieve, a Russian Company Commander in the late war, in his notes on "The infantry combat in the Russo-Japanese war," states:—"The high explosive shell filled with Shimose powder, which is so much talked about, has little effect against living targets, the fragments of the shell are too small—they are almost dust in fact. On the other hand if it produces little real effect, it bursts with a terrific noise,..... and the result is that a deep impresion is made on *unseasoned*[1] soldiers." Another Russian Company Commander states "That on the *seasoned*[1] soldier the effect of shrapnel has a greater effect than high explosive shell, but that the *unseasoned*[1] soldier is more affected by high explosive shell, though he soon gets used to it."

Although neither the Japanese nor Russians were armed with a Q.F. field gun, yet the expenditure of ammunition was far in excess of what has taken place in previous campaigns. In the engagement at Ta-Shih-Chiao, on the 24th July, 1904, a Russian battery fired 4,100 rounds—an average of about 522 rounds per gun. In front of Mukden, the corps artillery of the 3rd army are said to have fired 550 rounds per gun; and neither of these cases can be considered as exceptional.

The mobility of heavy guns, as exemplified by the Boer war, has already been indicated. It is known that the Japanese had very grave difficulties of transport to overcome on their line of communication, and that they were dependent on a single line of railway. Yet they were able to place in line 168 (174 by some accounts) heavy guns before Mukden (including the 28 c.m. howitzers from Port Arthur), and as far as can be ascertained at present, all these guns had a plentiful supply of ammunition. It is true that the Japanese have been condemned for their slow advance northwards, and this may have been partly caused by their anxiety to assemble all their heavy artillery. Yet it is clearly demonstrated that the heaviest guns are sufficiently mobile to take part in field operations. Whether any of these guns would have been saved had the Japanese attack on Mukden failed, must remain a matter of speculation; but, judging by the results of the battle of Kinchao, where the Russians lost the whole of their heavy artillery, most, if not all of the 168 Japanese guns would have fallen into Russian hands, if the Japanese had been forced to withdraw.

Subsequent history may possibly relate the difficulties in placing

[1] In these quotations the italics are mine.—Author.

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this heavy artillery into position, and whether, once sited, it was found impracticable to move; and it will be interesting to learn whether the trifling result achieved by it, was due to the difficulty of finding suitable positions, or to the fact that it was improvised.

From these two modern campaigns the conclusions are:—

1. That armies in the future will deploy on very extended fronts, and battles will continue for days or even weeks.

2. That an intimate co-operation between the infantry and artillery is not only very desirable—it is absolutely requisite.

3. That campaigns may resolve themselves into obstinate fights for localities.

4. That fortification will be even more largely used in future than in the past.

5. That invisibility has become an essential condition if not a dominating factor.

6. That the effect of artillery fire is more moral than physical, and shrapnel most feared by the seasoned soldier.

7. That an excessive expenditure of gun ammunition may be anticipated in the future.

8. That heavy artillery is sufficiently mobile to be used in field operations, but whether sufficiently mobile to be used *effectively* and *usefully* on the battlefield is still undecided.

B. DEFENSIVE TACTICS.

1. The Occupation of a Position:—

There are two main reasons which would usually decide a Commander to assume a defensive attitude—(a) to gain time in which to consolidate his resources and to receive reinforcements, or (b) to counteract the inferiority, numerical or moral, of his troops.

In both cases the position would be strongly fortified and, owing to the great bulk of modern armies and the delaying power of modern weapons, time would probably be available to construct strong field works. There would be this difference. In the first case the bulk of the troops would occupy the defensive lines prepared for an obstinate defence at all points. In the second case, the defensive line would be lightly held, and the larger number of the troops would be held concentrated ready to launch directly the enemy's line of advance was declared. The field works in this latter case being used as pivots on which to base the counter-stroke.

To force the attacker to an early deployment, the defender should lightly occupy advanced posts in front of his main line of defence, by mobile troops capable of being rapidly withdrawn. Ranges from the main position to localities likely to be occupied by the attackers would have been previously ascertained and plotted; and a fairly accurate fire at the most distant ranges maintained, under cover of which these advanced troops could withdraw. A grave objection to this long-range fire is that it may prematurely disclose the main position, and thus facilitate one of the hardest tasks of the attackers—that of locating the defender's position.

It is however, an opportunity for heavy artillery whose long range would give them a wide choice of site. They could be retired some-

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what from the main line, and should be located so as to be concealed by folds of the ground, and on no account placed in closed works against which the attacker could concentrate his fire. Their fire could thus supplement that of the field artillery, and could possibly flank artillery positions likely to be occupied by the attacker—an important consideration, since the shields of the present field artillery afford almost complete immunity against direct fire.

In an extensive position previously selected (such as the Russian position south of Mukden) temporary rails could be laid down for the movement of heavy ordnance but it would only be possible where the surface of the terrain was hard and suitable and did not require much ballasting. This must be considered an exceptional use in field operations, as sidings and several connections would be required with the main line, and the labour requisite for the construction and care of these lines could probably be more advantageously expended elsewhere. Moreover, the withdrawal of such heavy ordnance and their stores in case of defeat would be difficult, if not impracticable.

As the attack progresses the advancing infantry will protect themselves by shelter trenches of weak profile. Against these, or against infantry in the open, the heavy artillery could effect little more than the field artillery, and they would be better employed against the hostile artillery. In the battles of the future, presumably, all field artillery will be provided with shields impenetrable alike by the shrapnel of field or heavy artillery. To obtain "direct hits" requires too large an expenditure of ammunition to be attempted. Heavy artillery can therefore only hope for superiority by enfilade fire.

It is often urged that heavy artillery could be usefully employed by the defence in support of the counterstroke, but they are not sufficiently mobile to accompany the troops making the counter-stroke, and indirect fire from retired positions could hardly be of much assistance to rapidly moving troops carrying out a counter-stroke. Shielded field artillery using direct fire would appear to be more suitable for the task.

Should the attacker employ heavy artillery, it would naturally be the first objective of the defenders' heavy artillery. The heavy howitzers being used against positions protected against direct fire by natural features of the ground or artificial cover.

The best site for heavy artillery, whether on the flanks or in the centre of the defensive line, must depend largely on the configuration of the ground and the tactical requirements. Concealed positions easy of access are a necessity.

If on the flanks of a line, they can bring a cross or enfilade fire on the front (which is of special importance against hostile shielded artillery): and they would be useful in frustrating any hostile out-flanking movement; but on a flank they would be in a somewhat exposed position and require special protection. In the centre they would have a wider lateral range and would require no special protection.

It will probably more generally happen that the position of the heavy artillery will be decided by the configuration of the ground—sites being chosen from which a commanding view can be obtained and which dominate localities, the possession of which, it is desired to deny to the enemy.

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2. Rear Guards:—

Heavy artillery cannot be usefully employed with rear guards. The more mobile the troops of the rear guard are, the better will they be able to fulfil their object. Rear guards are not intended to fight, but to impose on the pursuing troops by a show of force, never becoming so seriously engaged as to need assistance in extricating themselves. This necessitates constant change of position, and at times, rapid movement; and for this heavy artillery are quite unsuited.

3. River Crossing:—

In defending the passage over a river there would appear to be a considerable scope for the employment of heavy artillery, but this is apparent, not real.

It is only in exceptional cases that the attacker is confined to definite localities at which to force a passage. Usually there is a wider choice, and the defender must, by a carefully organised system of patrols and spies, endeavour to gain sufficient information to enable him to distinguish the feints from the real attacks. Then it becomes a question of which side can the more rapidly reinforce the threatened point.

The defender knowing that he cannot hope to be strong everywhere protects certain important crossings with detached bodies, holding the main body of his forces concentrated. Heavy artillery might be more useful in suitable country, than field artillery, with the detached bodies of troops watching these important crossings; but they would require adequate escort. With the main body of the defending forces, the lack of mobility of heavy artillery would seriously cramp their utility.

In the exceptional case where the points of passage are confined to well-defined localities and where suitable positions exist, heavy artillery would be of the utmost value. There are, however, but few examples in military history of the passage of a river being attempted in face of an army in position, unless the attacker believes himself to be in overwhelming superiority.

4. Posts on the Lines of Communication:—

There remains finally to be considered the use of heavy artillery on the lines of communication, and it is here that the characteristics of this arm show to the greatest advantage. The want of a shield can be compensated for by the entrenchments; a plentiful supply of ammunition can be stored close at hand; and, by a judicious choice of a site combining an all round fire with an extensive view, the powerful and long range of one or two heavy pieces of ordnance may dominate a very large area.

C. OFFENSIVE TACTICS.

1. Attack of a position:—

Offensive tactics imply superiority as defensive imply inferiority, supposed or real. The attack of a position is perhaps best considered in phases. Throughout each phase it must be understood that the essence of success is co-operation between the three arms.

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Firstly, the preliminary reconnaissance; then the advance of the infantry covered by artillery fire; and finally the assault. It is impossible to define, even approximately, the time each of these three phases will occupy, or even the successive steps to be taken, all depends on the terrain, the dispositions, and the character of the defender.

1st Phase:—

The preliminary reconnaissance consists of driving in the advanced posts of the defender and locating the position of his flanks and of his main body, without committing the advancing troops to a definite line of attack. This task generally falls to the lot of the cavalry and field artillery, as they are the less likely to become seriously involved. It may be necessary to employ some infantry, especially against a skilful foe determined to keep his dispositions concealed to the last.

The troops employed must be mobile.

2nd Phase:—

On the often imperfect information obtained, the attacking infantry is launched, protected by the artillery in previously selected positions. Though the attacker may be ignorant of the dispositions of his foe, he possesses the almost inestimable advantage of the initiative. The defender must conform to his movements. Generally speaking, a frontal attack will be combined with a turning movement against one or both flanks.

The troops making the turning movement must make a wide detour and move rapidly in order to gain the advantage of surprise. Heavy artillery with their long range would be of great value in bringing an enfilade fire to bear on the hostile lines, but they have no shields, and must, therefore, seek covered positions; also, they require carefully selected positions which they cannot take up or change rapidly. They are consequently unsuited for use with the flank attack.

It remains then to consider their use with the troops making the frontal attack.

Until the defending infantry has disclosed its position it will be difficult for the commander of the attacking force to decide against which point he will concentrate. He will, therefore, be wise to hold back the heavy artillery, using them in a manner, as his reserve until his final dispositions are made. A change of position for them entails such loss of time that it must be avoided if possible.

3rd Phase:—

During the final phase, heavy artillery would remain in position, taking up the task of those field artillery batteries moved into close range; and assisting with as rapid a fire as possible in breaking down the resistance of the defenders at the point assaulted. At the moment of assault with lengthened fuze and range they could be used against the enemy's reinforcements, and against his formed bodies further in rear. This would necessarily be unobserved fire, and unobserved fire seldom has either material or moral effect, and is usually not

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worth the waste of ammunition, more especially in the case of the ammunition for heavy guns—the bringing up of which entails such heavy demands on the transport service.

It is often stated that heavy artillery are required to attack the entrenchments and fortified villages which will usually be found in a fortified position. Entrenchments will probably be more extensively used in the future than in the past, and villages are more likely to be included in the defensive line or area on account of the far greater extent of front now occupied. There would, therefore, appear to be a widening field for the employment of heavy artillery. The more especially is this the case as the field artillery in their desire for mobility will no doubt adopt a lighter howitzer than the 5-inch—in fact it is believed that experiments are now being carried out with one.

Pursuit:—

In the pursuit which follows a successful action, heavy guns and howitzers, on account of their long range, would be able seriously to harass the retreating troops; but there are few countries where ranges over 6,000 yards are not the exception, and, assuming that the heavy artillery have been taking advantage of their long range during the attack, it would not be a light task for them to limber up and join in the pursuit. Though on this occasion they could be used with great boldness, as there could be little danger of counter-attacks. Still, their value is limited by their slowness in coming into action, as their targets would be moving ones.

1. Advanced guards:—

From what has already been stated it is clear that heavy artillery are out of place with advanced guards, they do not possess the mobility required to commence or break off an action rapidly. They would be of advantage in rendering farm houses or small patches of wood untenable, but this duty could be equally well performed by the 5-inch howitzers. Further, in chance encounters their immobility might seriously cramp the manœuvring capability of the remainder of the advanced guard.

3. River crossings:—

The converse of much of what has already been said regarding the defence of river crossings naturally applies to forcing a passage. The attacker having decided on a suitable place for crossing endeavours to deceive the defender by feints, meanwhile completing his preparations for a rapid concentration at the point selected. The duty of covering the crossing falls on the artillery, and consequently positions for them which dominate the far bank, are essential.

After the leading infantry have crossed and established themselves in a covering position, they must be supported by the advance of some batteries into line with them. The flanks and front of the covering position being protected as far as possible by the fire of the batteries still in position on the near bank.

If the country is open and observation possible at long ranges, heavy artillery can very materially assist the other arms—the heavy guns with shrapnel at ranges beyond that of the field artillery—the

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heavy howitzers with their steep curved fire searching cover in advance of the leading infantry, or breaching with high explosive shell any houses or villages barring the advance.

The best site for the heavy artillery would be on the flanks of the first artillery position on the near bank; here they should remain until the whole of the field artillery had crossed and gained positions in advance.

From this brief study of tactical operations, it is clear:—

1. That the utility of heavy artillery depends largely on the character of the country in the theatre of operations. An extensive field of fire and facilities for observation being essential.

2. That they have no individual rôle. They are supplementary to the field artillery.

3. That in a defensive line they must be sited so as to enfilade the likely positions for the attacking artillery. In other operations their utility is limited by their lack of mobility.

4. That in attack, heavy artillery should be maintained as a general reserve and not brought into action until the attack has developed.

5. That there is a widening field for them in the attack of villages and field defences.

6. That the provision of shields would add largely to their value in field operations.

D. PROBABLE THEATRE OF WAR OF OUR FUTURE OPERATIONS.

Setting aside the question of invasion or of our participation in a conflict on European battlefields, there remain to be considered operations on the frontiers of Canada and Afghanistan. Of these it is only proposed to deal with Afghanistan, because, for commercial reasons, even beyond the ties of kinship, a conflict with America is unlikely.

Our opponent on the Afghan frontier may be either Asiatic or European. The probability of our meeting a European army there is at present remote, owing partly to the internal disorders in Russia and partly to the existence of the buffer state—Afghanistan—the integrity of which it is our policy to maintain. The Asiatics we should be called on to meet may either be Afghans or the frontier tribes, or a combination of the two.

The Afghan army is badly organised and poorly armed, equipped with obsolete artillery, and composed of a conglomerate of ill-assorted units likely to fall apart at the first disaster. Their tactics consist of the passive occupation of a defensive position, strengthened by what is known as "sangars," which are breastworks constructed of loose stones and rocks. The Asiatic is an adept at taking cover, and once safely ensconced—with a plentiful supply of ammunition—he is difficult to move. Once driven from his position however, his power of resistance rapidly declines, and though capable at times of fanatical rushes across perfectly open ground to almost certain death, he does not possess that sustained courage so vital to the soldier.

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It may happen that the defensive position comprises a fortified village or small town, such as Ghuznee, where each house is in itself a fort. Built of mud and hardened by the sun until it almost resembles soft sandstone, these villages are often surrounded by a massive wall, and their capture would involve very heavy loss unless artillery sufficiently powerful to breach the wall and houses is available.

Similarly, with the "sangars" or breastworks, a shell sufficiently heavy to demolish or damage the "sangar" is required, and this is generally sufficient to bring about the retirement of the defenders. To attack the "sangars" according to the normal method, i.e., to keep down the fire of the defenders by shrapnel whilst the infantry advanced to assaulting distance, offers few advantages, and would certainly entail heavy loss on the infantry. The Asiatic has no baggage or matériel to fall into the hands of the victor; and though particularly sensitive about his line of retreat, he has no vulnerable line of communication in the ordinary sense of the term.

Further, the Afghans and frontier tribes, being Mahommedans, dread mutilation even more than death. The devastating effect of the burst of a powerful shell, therefore, more quickly effects their "moral" than the heaviest hail of bullets; and once "shaken" they are soon demoralised owing to lack of discipline.

The climatic conditions and the character of the terrain of Afghanistan and of the Indian border-land, closely resemble in many particulars those of South Africa. It may, consequently, be assumed to be a country suitable for the employment of heavy artillery, though its rugged nature will entail heavy demands on the transport, and the lack of railways may severely affect the ammunition supply.

The clear atmosphere greatly facilitates observation even at the longest ranges. The country is quite unenclosed, and where level enough is suitable for the movement of artillery in all directions.

The disadvantages entailed on the heavy artillery by the lack of shields would not be seriously felt as the Afghans are not at present well armed, but it must not be forgotten that this may be altered in the near future, as the workshops in Cabul will soon, it is reported, be capable of manufacturing modern rifles and field guns, though the latter in small numbers only.

E. CONCLUDING REMARKS.

Before framing rules for the employment of heavy artillery and formulating our conclusions, let us briefly review some of the points already dealt with and mention a few others of interest:—

Field operations will in future resemble siege on account of the increased retaining power of modern weapons. The attacker must first locate the foe—probe his dispositions—reconnoitre the ground—perfect his own plan—and then, set his troops in motion. Each of these actions though described in a few words, will in the face of a skilful enemy occupy a considerable time—days or even weeks.

This period will be utilised by the defender in protecting himself by every known method of fortification. Shelter trenches for the

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firing line supports and reserves, gun-pits or epaulments for the artillery, redoubts for the protection of important points or localities and entanglements or other obstacles, where facilities for such exist.

Now what is to be the rôle of the attacking heavy artillery. It is acknowledged, or rather it has been demonstrated by practical experience in the last two campaigns that their effect against mâtériel is a negligible quantity.

They are inferior as a man-killing weapon to field artillery. There remains their long range, which can only be fully untilised under special climatic and topographical conditions, and their undoubted moral effect.—*Unless it is possible that heavy artillery have never yet been used in the field in such a manner as to test their true tactical value.*

The moral effect of heavy artillery projectiles, we are told, is greater on the unseasoned soldier. But it is not only the moral effect on our opponent that we have to think of, there is also the question of the encouragement of own troops.

Certain Russian Officers attached to mortar batteries at the battle of Mukden speak in high terms of the great effect of their fire—reports from Japanese sources make little reference to these pieces; they appear almost to have passed unnoticed; similarly with regard to the Japanese artillery. Russian reports mention it as having caused little damage,[1] whilst officers attached to the Japanese army were much impressed by its apparent efficacy.

The encouragement which each side derived from the fire of its own heavy artillery was evidently greater than the damaging effect (moral as well as physical) which it had on the opponent.

The weight of the projectile and cartridge of heavy artillery necessitates the most careful husbanding of ammunition; accuracy, therefore, is of even greater importance for them than for field artillery. Further, it is usually considered that they should open fire at far longer ranges. Redoubled care is consequently required in the establishment of observation stations, the laying out of the line of fire, the observation of fire, the preparation of the gun floor and of the means of checking recoil. Balloons and kites must be connected by telephone with the observing stations to assist observation, and observation of fire instruments set up. The choice of site requires far greater care than in the case of field artillery—it cannot be easily changed—it must be concealed—and should be within a reasonable distance of good observing stations.

This all takes time which formerly was not available. But now when we have undisputed evidence that the battles of the future will be long drawn out exhausting struggles—resembling siege operations—*time will be available.*

The Japanese and the Russians commenced the Manchurian campaign without a properly organized heavy artillery; yet both made extraordinary efforts to improvise this arm. They had an exist-

[1] Note.—Captain Krasnow—a Russian Company Commander at the battle of Mukden—writes:—"but these guns (Japanese heavy guns) did little damage because, it is very difficult from a distance of some thousands of metres, to hit a narrow trench."

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ing field artillery, with the use of which in field operations they were familiar. Naturally the heavy artillery was organised on the lines of heavy field artillery, and was employed tactically in the field as field artillery. It is not, therefore, surprising that the results should have been so disappointing and inconclusive.

In South Africa we also improvised heavy artillery, using it as an adjunct to field artillery; it served our purpose; and its misuse was not so prominently brought to notice as in the war in Manchuria, on account of the exceptional character of our opponents.

In using heavy artillery in conjunction with field artillery, are we not endeavouring to make one gun fulfil two tasks? At the time of the Great Elector of Prussia it was customary to attach two or more field guns to each infantry battalion and thus fritter away almost the whole power of the arm; field artillery had in fact no Tactical Entity. It remained for Napoleon to bring the artillery under one head—one organization—and show what its true tactical employment in the field should be. Is it not possible that the present use of heavy artillery as supplementary to field artillery is analogous to the employment of field guns with battalions?

We have a suitable organization outlined in "Garrison Artillery Training," 1906, Vol. II., and on page 2 it states:—" It is intended " that, in addition to being available for use in a siege, they (siege " artillery brigades) should be utilised, if required, in the field." But co-operation in war can only be secured by co-operation in peace; and true tactical co-operation is obtained by an intimate and practical knowledge of the requirements of the other arms, and by associating with them in manœuvres. We have endeavoured to trace the causes of the partial failure of heavy artillery in the late war and have shown that they were probably due to that arm being improvised, and its uses not being properly understood. Can we not avoid this error in the future by establishing this arm in peace, ready to take the field under its own supreme head and with its own trained staff capable of utilising to the full its undeniably great powers.

France—whose very existence depends on a true insight into future military requirements—has decided to adopt a 15·5 c.m. (6·2-inch) howitzer, and has already allotted a large sum for the provision of horses. General De Négrier in an article in the " Revue des deux Mondes," states:—" The artillery must look two essential points in " the face. First, to provide a very large ammunition supply; next, " to construct a large calibre artillery, of which the batteries will be " allotted to the Corps d'Armee."

This view is not supported by General Langlois, who is in favour of the introduction of a small calibre gun, such as the Pom-pom. But General Langlois bases his conclusions on the results of the South African and Manchurian Campaigns, making no allowance for the fact that the heavy artillery in both these wars was improvised and that, therefore, the results are misleading.

Much has been lately written about the attack of shielded guns by long range enfilade fire (presumably shrapnel) from heavy guns. It must not be forgotten however, that shrapnel fire at ranges over

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6,000 yards (the range of 18-pr. shrapnel) is not likely to be very accurate even under the most favourable conditions; that field artillery have ever recognised the devastating effect of enfilade fire and are always on the watch to avoid it, and that a field battery finding itself exposed to an enfilade fire would very quickly move.

Our conclusions then are:—

That even as used in the last two campaigns, as supplementary to field artillery, heavy artillery can usefully co-operate to a very large extent in field operations.

And,

That the rules for its tactical employment in this rôle are:—

1. Heavy artillery should take advantage of its long range and endeavour to obtain an enfilade or cross fire.

2. Concealed positions, or artificial cover, are essential, and it may, therefore, be necessary to disperse, but communication must be maintained by telephone, telegraph or signalling, to ensure concentration of fire. Guns should not be employed singly.

3. Ammunition must be jealously husbanded.

4. Good observing stations are of vital importance. Unobserved fire is useless.

5. The range of heavy artillery gives them a wide choice of site, but the configuration of the ground will usually be the deciding factor.

6. Heavy artillery cannot accelerate their pace under fire, nor change position quickly; they should, therefore, not be brought into action early, but should wait until the tactical situation is clear.

7. The choice of projectile depends on the nature of the task, but high explosive shell would generally be used.

But,

"That the true tactical use of heavy artillery has not yet been tested in the field of battle and cannot be until it has a Tactical Entity. It must be formed in peace—not improvised in war. To ensure co-operation in war it must co-operate in peace. The personnel are available—our present Royal Garrison Artillery companies—which would be relieved in war from their coast defence duties by the Territorial army.

At Sebastopol, at Plevna, at Paris, and lastly at Port Arthur, would not a well organised and well equipped heavy artillery, ready at hand, marching two or three days behind the more mobile troops, have obviated dangerous delays, saved many valuable lives, and have been available if required for use in the field.

Let us take the lesson to heart and in the future avoid these costly and inefficient improvisations."

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The value of Coast Fortresses.

By LIEUT. H. G. de WATTEVILLE, R.A.

IN the September number of last year's Journal there appeared an article by Colonel J. T. Johnston, R.A., entitled "Some Notes on Coast Fortress Warfare." At the beginning of this article the hope is expressed, that "these notes may attract the attention of others and raise discussion, so that clear thinking may result." Nevertheless the subject has hitherto aroused little discussion in the Journal, so that it may not be altogether out of place to try to re-open the matter. In order to think clearly, it is highly advantageous to start with clear and universally accepted ideas as to the fundamental principles on which ensuing arguments and deductions are based. Now in these notes some strategic assumptions as to the purpose and duties of coast fortresses are made, which may not strike every reader as being universally accepted.

If the purpose and duties of such fortresses be analysed, the following seem to be the only conclusions to be deduced. The dock-yards, supply and coal dépôts of a naval power exist solely for the maintenance of its fleets. They stand in the same relation to all the sea-going squadrons of that power, as bases of supply do to its field armies. Just as in land warfare no civilized army could maintain itself in the field without a base from which to draw supplies and reinforcements, so no fleet can expect to keep the seas, or even exist, without some bases where to obtain coal and to make good defects. Yet there is a great difference between naval and military bases. The army advances and maintains its connection with its base by a line of communications, whereas the ships of a fleet must, at some time or another, (even allowing for the largely increased use of "fleet auxiliaries"), themselves return either to their original or to another similar base. Further an army by its own advance and consequent pressure on the enemy will always tend to protect its base, though of course the actual lines of communication become more vulnerable as they increase in length. A fleet can only protect its bases in a far lesser degree, since the enemy's ports still remain at the same distance from the friendly bases, which may be left absolutely uncovered by an eccentric movement of the fleet into other waters. Naval bases too are essentially limited to single points, which strategic teaching shows to be the worst form of a base; the military base, on the other hand, may be a long strip of coast or frontier covered by strong fortresses or natural obstacles, and may have many alternative roads and railways leading to the front.

It is admitted that the greatest strategic feat which a military commander can accomplish is that of cutting himself adrift from his

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base for any period of time, however short it may be. This is nearly identical in meaning to the statement that bases of supply and lines of communication are the greatest obstacles which a commander encounters in the field. Similarly this holds good of a fleet in the sense that the longer its ships can keep the sea, without visiting a base for re-fitting, coaling, &c., the greater will be the radius of action and fighting value of that fleet. Military and naval bases alike may thus be styled necessary evils; their advantages are purely negative, that is, these advantages will vary and depend entirely on how far the number, position and resources of the bases counterbalance the taint of their original sin, and on how far they are superior in equipment to those possessed by the enemy.

All bases, naval and military alike, are liable to attack, and must be defended; the better a base is able to resist attack, the less likely will the probability of attack become. In this respect a naval base possesses still further weaknesses; firstly, the situation of all naval bases is dictated more by naval needs and by geographical peculiarities of coast line than by any military strategic or tactical requirements. Certain harbours may have to be selected as naval bases without reference to their capabilities for defence, or their place in any wide scheme of operations involving offensive or defensive military action. Secondly, the tendency of naval requirements is at present to cause the extension of dockyards in a manner that still complicates their defence. Thirdly, a great dockyard or supply base forms a vulnerable target of immense area, which is very sensitive, or at the very least, most liable to be disorganised, by even a short spell of bombardment, if observation of fire is possible. Lastly, if an attack on a dockyard is impending, the naval stores and docks cannot be removed to a place of safety in any appreciable quantity, neither is it of any avail destroying them to prevent their falling into hostile possession, as might be done with military dépôts, since the needs of a fleet are more complex and require greater technical resources. The self-destruction of a dockyard would be but anticipating defeat, and in any case must cause an irreparable loss to a fleet. Such a loss cannot be compared to that inflicted on an army by the destruction of a supply dépôt.

For all these various reasons, the defence of a naval base is a far more difficult and a far more important task than the defence of a base of a field army. The military base is never exposed to the same dangers, and would rarely be left to its own resources for defence in the same manner as may happen to the naval base for the same length of time. Even the very presence of ships in a naval base may hamper the defence; a harbour to a sea-going fleet will often be a trap, where it may be caught at a disadvantage, and prevented from putting out its strength. Since the reward of success is so great, there is every conceivable inducement to attempt to cripple a strong naval power by a *coup de main* against one or more of its bases.

To protect these bases, easily vulnerable and yet so essential to a fleet, there have been formed coast fortresses; and their duty can be solely that of protecting naval bases. It is immaterial whether

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they are considered as "mere naval adjuncts" or as "imperial assets"; the meanest torpedo boat afloat is also "an imperial asset" as much as any company of volunteer infantry. Coast fortresses, since they protect naval bases, are a factor of the highest importance in the maintenance of naval supremacy; we accept them as such, and that is enough. But it is more difficult to follow the argument that a coast fortress can "secure for the Empire the same advantages that land fortification secures to a purely military force." The meaning is not quite apparent; if it be intended to indicate that a coast fortress protects a naval base, just as field fortification is invaluable for the defence of a military base, then no objection can be raised. On the other hand, land fortification can be used by an army on the offensive; for the army carries spades and axes as well as rifles, but how can a fleet use a coast fortress when in action at sea? The next paragraph, however, makes it clear that these arguments rest on a very free generalization on the subject of land and coast fortresses. Here in a summary of the "Advantages to be expected from them," i.e. coast fortresses, it is said that they:—

1. Constitute a pivot of manœuvre.
2. Make for economy of force.
3. Gain time.

Now, these are the usual "text-book advantages" ascribed to fortresses, land fortresses be it understood, and it would appear very doubtful whether these same advantages can be said to hold good of coast fortresses also. It is also necessary to differentiate clearly between the naval and military functions of a coast fortress. Co-operation between the services must not lead to confusion of thought or action. But before discussing these advantages, a comparison should be drawn between a coast fortress—like Portsmouth, Plymouth, Brest or Cherbourg—and any modern land fortress—say Toul, Metz, Posen or Warsaw.

It will be seen that the former, from its geographical position, with its large vulnerable area, and other disadvantages, cannot, as a fortress, for a moment compare with the latter, which, from a military standpoint occupies a strong strategic and tactical position, is fortified regardless of any but military needs, and situated so as to dominate a river crossing and the sheaf of roads and railways forming one of an invader's main lines of advance. Such a land fortress, too, has little to fear from anything but systematic bombardment, since they have no sensitive area to guard; while, as a last resort, its works and stores can be destroyed without occasioning the same loss to an army as the destruction of a dockyard would cause to a fleet. Finally, are the garrisons of the two fortresses on the same plane? Can the small, semi-mobile garrison of second line troops (and these epithets are just as applicable to foreign as they are to English garrisons) of the coast fortress be compared to the miniature mobile field army stationed in the foreign land fortresses enumerated above?

The various functions of a land fortress cannot be more clearly set forth than in Napoleon's own definition. This is that fortresses

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can serve, first as a secure base to an army, secondly as a strategic pivot, thirdly as a barrier to a defile or river crossing.[1] There could be no finer instances of how fortresses can be used in offensive strategy than in the campaigns of 1805, 1806 and 1809. Jomini sees in fortresses a means of assisting the operations of a field army and of covering a frontier. Besides serving these purposes, the above authorities also declare that a fortress may defend a capital or a very important centre of national wealth; lastly, in a conquered country it may serve as a military centre and arsenal to an army of occupation. Applying these definitions to the modern fortresses of a "two-frontier" country like Germany, they will be found to be absolutely true at the present day. At the outbreak of war, the German fortresses on both Eastern and Western frontiers would at once cover the mobilization of the field armies. Then, if attacked by the natural coalition, she can with the help of her fortresses elect to fight defensively on the one frontier, whilst attacking on the other. Thus if defending the Metz—Strasburg line, these two fortresses will prove of incalculable help to the small forces holding that line. They deny vital river crossings, roads and railways to the enemy, they can cover a flank of an army; lastly, if that army be driven back, they still remain as a serious menace to the communications of a pursuing enemy, and thus long delay his advance. But on the Eastern frontier, if the German army is successful in its offensive and advances East, what is the function of her frontier fortresses? They now can only serve as secure dépôts for the field army, in fact they sink down to the rank of a fortified base. It is, therefore, only in the first instance that the fortresses will fulfil those three text-book axioms. Indeed it is really only in that "offensive—defensive" strategy so brilliantly developed around the Veronese group of fortresses by Bonaparte in 1796, and again by the Archduke in 1866, that the land fortress can exhibit those three qualities at their best. A fortress may thus become a most important factor in the successful utilization of interior lines. Then indeed it may be said to constitute in the fullest meaning of the phase a pivot of manœuvre, to gain time, and to bring about an economy of force. On the other hand, if the fortress sinks to the level of a fortified base, does it still fulfil those three functions? The answer can only be no. It can and does protect stores and hospitals against raids and *coups de main*, such as were carried out by the Confederates in the American Civil War or by Mishchenko's cossacks against Newchwang in 1905. But to say that these bases form pivots of manœuvre in the strategic sense,[2] or gain time, is entirely beside the mark. Economy of force

[1] Napoleon's scheme of coast fortification for the greater French Empire is most interesting. He foresaw the future importance of Antwerp, The Helder, Spezzia and Pola, and initiated their system of defences. Pola and Spezzia are now coast defences of the first rank. Antwerp is one of the greatest ports of the world.

[2] The phrase "pivot of manœuvre," is a dangerous one in a strategic sense. It recalls vividly the fatal decision of Bazaine to retire into Metz. At the farm of Grimont on August 26, 1870, the French Generals allowed themselves to be persuaded by an Engineer, General de Coffinières, to take that step. His words were . . . "Metz avait été agrandie et ameliorée justement dans le but de jouer ce rôle. c'est à dire pour servir de centre et de pivot de manœuvre à une armée chargée de défendre la Lorraine."

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is indeed obtained in a very minor sense, namely, in so far as any fortification enables a small force to oppose a far larger one. Strategy, and "Imperial" strategy at that, intends all bases to be organised for passive defence only. The tactics of the defenders of course may be offensive in the extreme, but that is another matter. Lastly, the use of a fortress in defending a capital or centre of national wealth can only be intended to stave off raids, prevent panic, and in case of a successful invasion to act as a forlorn hope, while a fresh army is preparing in another part of the country to take the field against the enemy.

Let the functions of the land and coast fortresses be compared, and it will immediately be recognised that the only functions of the coast fortress which approach those of the land fortress are two, namely:—

1. The land fortress at the outbreak of hostilities covers the mobilization of an army and protects a main line of advance from raid; the coast fortress covers the mobilization of a fleet, and also protects the ships in harbour from torpedo attack.

2. Both fortresses act as a fortified base—the one to an army, the other to a fleet.

Both of these are functions of passive defence only, at least from a strategic aspect.

From what has been said above, it is obviously futile to pretend to make the coast fortress play the same part as a land fortress in an offensive—defensive campaign, and style it a "pivot of manœuvre." Moreover, even in the case of a land fortress it is not the fortress itself which really in itself possesses these advantages, it is the presence of a field army which endows it with these ephemeral attributes. Even taking an extreme case like that of Toulon, supposing France to be invaded along the coast from Italy, is it the coast fortress with its garrison that would check such an invasion? It would rather be the task of a large French field army; whether this army rested its flank on Toulon hardly affects the question at all. Finally, it may be asked how a coast fortress can be a pivot of manœuvre for an army when the sea probably cuts off at least one half of its would-be sphere of action.

Port Arthur is quoted by Colonel Johnston as a striking example of the advantages of a coast fortress. Nevertheless he is forced to admit that the Russians did not utilise that fortress as a pivot of manœuvre by land, and only to a certain extent by sea. But how could Port Arthur ever have served as a pivot of manœuvre by land, which term Colonel Johnston defines as "a secure point from which "a commander can prepare and launch a stroke in any required "direction, and to which he can return after delivery of the stroke." In what direction could a commander have launched a stroke from Port Arthur save along the one single line leading to Liao-Yang? And if he had launched his stroke along that line what good would his 40,000 men have done? The Japanese placed by an inexorable geography on interior lines would have defeated them as surely as they did Stackelberg's army moving in the inverse direction. And

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would these defeated remnants have ever reached Port Arthur again? An enterprising enemy having command of the sea might easily in the meantime have landed a force sufficient to hold the Nanshan Isthmus, if not to have marched into the fortress itself. It is true Port Arthur is an extreme instance on account of its situation, yet every coast fortress suffers more or less from the same defect. But to quote Port Arthur as a pivot of manœuvre is almost on the same plane as attributing the same part to the coast fortress of Singapore in case of an invasion of Burmah by an enemy possessed of a maritime strength at least equal to our own in those seas.

The question of how far Port Arthur was, or was not, the cause of an economy of force to the Russians is at first sight not so clear. The question is complicated by three considerations; first, that the Japanese attached a sentimental importance to the recapture of the fortress; secondly, the desire to deprive any possible reinforcements from Europe of a naval base open all the year round; thirdly and principally, the necessity of destroying the Russian ships caged in the harbour, if not the actual hope of annexing these vessels to the Japanese navy before the possible arrival of a Baltic fleet. It was, indeed, the numerical weakness of the Japanese navy that rendered the siege necessary. Otherwise the really sound Japanese strategy would have been to cover the fortress with a small force and to have moved Nogi's entire army towards Liao-Yang. Would that have been economy of force for Russia? A few thousand men on the Nanshan Isthmus, covered by a few gunboats on either flank, would have securely caught the Russians in a trap, so long as the command of the sea was not with them. Ten thousand, and probably less, Japanese would have held four times that number of Russians. Again, as regards the question of time, it is not clear how Port Arthur gained time for the Russians. Was it not rather the long delay after the opening of hostilities, the question of ice-free landing places, the difficult, roadless country, and the crucial question of transport that retarded the advance of the Japanese armies far more than the existence of Port Arthur? Under other conditions of sea-power, as stated before, the fortress could have been almost disregarded, but for a small covering force. It can be repeated again, the whole question of influence which Port Arthur exerted on the strategy of the campaign turns on the fact that the balance of naval power was so very nearly level from the very beginning. The paper strength of the two fleets at the outbreak of war was almost equal; after the loss of two battleships in May, the Japanese were theoretically in a state of slight inferiority, hence the strenuous efforts to destroy the Russian fleet in its own base. Then again, there was the dependence of the Japanese armies in Manchuria on sea power for their supplies. In a war between two countries not separated by sea and under similar conditions as to strength on sea and land, no coast fortress would attract such attention as did Port Arthur from the Japanese. The Japanese, in fact, sacrificed military strategy to allay their anxiety as to their command of the sea. Moreover, even though Port Arthur may have contained a Japanese army, and this army until August was none so large, there remains the question

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whether it brought about such a striking economy of force. To begin with, is it not true that the garrison and resources of Port Arthur, if placed at the disposal of the Russan commander for his field army during the earlier phase of the war, might not have proved of great value to the Russians? Again, during the second phase, when Port Arthur was actually besieged, would not that same garrison and the resources of the fortress, together with the force wasted on an idle attempt at relief, have been better employed at Liao-Yang? The investing Japanese force was far from being so greatly superior to the garrison. Lastly, if the entire theatre of operations be considered, is it not true that the defence and maintenance of Port Arthur and Vladivostok together swallowed up as many men as the Japanese set before the Liao-Tung fortress. That is not economy of force, and never can be, so long as the garrisons of coast fortresses are allowed to grow to the size of that of Port Arthur, and so long as the possession of more than the very fewest naval bases requires the dispersion of large numbers of troops along the coast.

The case of Santiago de Cuba in the war of 1898 is no better instance of the true rôle of a coast fortress. The Spanish committed the criminal error of shutting up into that fortress both a field army and a sea-going squadron. The Americans had thus the opportunity of destroying both land and sea forces together, and at the same time of seizing an important economic centre all at one blow. The poor quality of the works of defence rendered the place hardly worthy to be called a coast fortress.

The great danger of a coast fortress luring a weak or demoralised fleet into temporary security is very real, and the two fortresses named above clearly illustrate the risk. It would appear that to a fleet it is just as suicidal to run into shelter of its fortified base, as it is for an army to seek the assistance of permanent fortifications. In both cases it is the result of some conscious weakness, that is bound to affect the moral of the men and cramp the initiative of commanders. The fleet has every right to visit its base for refitting, or to lie inside its defences when not required to keep the sea. Should it do so as a confession of weakness, it will infallibly be ruined, as was the fate of the Russian fleet in Port Arthur, or of the Spanish cruisers in Santiago. Even the Russian fleet could never have been accused of having used the fortress as a "pivot of manœuvre." The movements of that fleet more resembled the attempts of a blockaded force to break through the vigilant enemy. Like the invested land forces at Plevna, Metz, Santiago, and at Ladysmith an imprisoned fleet is at a serious disadvantage, and must suffer even more in a moral way than an army. Once a land force has been driven into a land fortress, and the investment is complete, the advantage of fortification begins to rest with the attack, and unless an assault is intended, it may happen, as it did at Metz and Paris, that superior numbers can be invested by a greatly inferior force. Somewhat similarly a blockaded fleet loses its mobility and manœuvring power, whilst it is exposed to eventual attack by torpedo, mine, and "blocker"; the superiority of the blockader is thus increased. In both an army and a fleet the resources of the defence will run out,

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and finally relief becomes possible only from outside.

In a "guerre de course" or commerce destruction, the small defended base assumes greater importance. As an instance it is possible to quote the French ports during the Napoleonic wars. These numerous small harbours, studded along the coast, and situated on the flank of the trade routes approaching the United Kingdom, each sheltering a few privateers, formed ideal bases for such a form of warfare. However, the small defended port is only a very minor coast fortress, and need hardly be discussed further.

The importance of the coast fortress in war would appear to vary inversely as the command of the sea. At the outbreak of naval war, the coast fortress should prove of the greatest value to the strong naval power. As the balance of naval power inclines against the enemy, in like measure will the importance of the fortress decrease. Finally, when the command of the sea is absolutely secured, the duties of the coast fortress almost come to an end. This fact was clearly shown by Captain Spender in an article which appeared in "The Journal of the Royal Artillery," November, 1906. There is a stage, he says, at which the first line troops of the coast fortress may be taken for operations elsewhere. With a preponderance of sea power the coast fortresses of the stronger side are never likely to be seriously attacked otherwise than by raid. It is here that Colonel Johnston's deductions may be most gravely questioned when he starts discussing the defence of British coast fortresses *when invested*—not our isolated foreign fortresses, such as Gibraltar, which fortress, indeed, might quite conceivably be besieged—but our very own home fortresses.

Such a contingency as the complete investment of a British coast fortress, like Portsmouth or Plymouth, depends on such a loss of naval power in the Channel as would entail the entire downfall of the Empire. But even from a hostile point of view it might well be asked whether such an investment is necessary. It would appear to be wholly unnecessary, since in the first place, our coast fortresses are not in any way prepared to meet investment; secondly, because, even if our coast fortresses had after the outbreak of war been placed in a state to resist a siege, an invasion of England on such a scale as to allow of a systematic investment, presupposes a hostile command of the sea, which would have long before then have starved the country into inanition. Preparations for siege are lengthy; the siege itself is lengthier, whilst a simple investment without siege methods presumes almost unlimited time. The facts are so clear as to require no further discussion.

But raid is another matter, especially at the outbreak of war, and during the earlier phases of naval fighting. It is for the purpose of resisting all such attempts that British fortresses have been established, and the whole of their defensive capabilities have been calculated and cut down to meet the requirements of that principle. Still less than the majority of Continental coast fortresses can the British fortresses be compared to the typical land fortresses enumerated some pages back. Auxiliary forces in no too plenteous numbers and semi-obsolete movable armament do not constitute an over-

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powering defence. Rightly so, since the purposes and duties of the two fortresses are widely different. The small garrison of the British coast fortress is only sufficient to repel raid, still more than the Continental fortress is it only calculated to act as a fortified base, still less can it under any circumstances be used as a pivot of manœuvre, can it gain time, or bring about economy of force by containing superior numbers of the enemy; its very weakness precludes that.[1]

The question of raid is naturally bound up with that of surprise. Now Colonel Johnston says that "having a sea front, a coast fortress is more liable to surprise," i.e. than a land fortress. That is undoubtedly so, but the statement must be qualified by the additional words "but on that sea front only." The sea presents no obstacles such as exist on land, and it is open to swift movement at night. Night raid thus becomes a most practical form of attack, and in view of English maritime superiority is one that must appear especially tempting to an enemy. The importance of fixed defences in this respect is obvious. But it should not be forgotten that the more efficient the fixed defences are, the more probably will expedients be found to annul their excellence. So in the coast warfare of the future far more unconventional methods of attack may be used than have been practised hitherto. Leaving out of account any ruses which might be employed on the water, the most profitable action would be to surprise the fixed defences themselves. The motor-boat, the dynamite cartridge and the hand-grenade might all be freely used in attempts to put out of action guns and searchlights, which are so often cruelly exposed from high ground directly in rear of the emplacements, or only railed off by an incomplete "unclimbable" fence. The searchlights are as a rule but poorly protected. A handful of men climbing a cliff with a Rexer automatic rifle might at a propitious moment destroy a whole gun detachment; a few agents of a hostile power domiciled in England could quite conceivably at the outbreak of war render absolutely useless the materiel of an entire battery. With a little enterprise and imagination, a few groups of determined men, by judicious wire cutting and similar methods, could possible demoralize, if not damage, the system of communications of the defence, if only for a night.

The question of an organised land raid by any force exceeding a small party is different. To begin with, such a force requires to be unmolested while landing; this, unless it be either before the declaration of hostilities, or after a considerable weakening of the military and naval defences of the harbour, must be effected at a certain distance from the fortress. The element of surprise in a

[1] Colonel Johnston uses the phrase "economy of force" in two senses; first in the sense of cutting down a detachment so as not to weaken another force; secondly in the sense that he quotes Port Arthur as "containing vastly superior numbers of Japanese obtaining thereby economy of force." The same object is obtained indirectly by two methods, but it must be remembered (a) that a number of scattered fortresses, of which one or two only are to receive the enemy's attention, does not constitute economy of force; (b) that to obtain this advantage of economy of force by means of coast fortresses, the enemy must be induced to attack a fixed proportion of them. Is he likely to do this? Coast fortresses are so widely scattered and situated so far on the fringe of the theatre of war that this is hardly probable.

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land raid is, therefore, more limited than it would be in the case of a land fortress for two reasons; firstly, because the landing of an organised force with any artillery on an open beach is hardly possible without some warning reaching the fortress, and the troops, when first landed, may not be ready for immediate movement, owing to land transport and such like questions; secondly, because the land perimeter of the coast fortress is probably only half that of the land fortress, while the actual localities suitable for disembarkation must be known to the defence.

But the real danger to the defence is the vulnerability of the naval base, and since this is so defenceless, it must remain the first care of the commander of a coast fortress. The fixed defences must be able to look after themselves, but the land front and attempted raids are questions apart. A combined raid by land and sea would be the hardest to meet successfully. But even under these conditions the fixed defences must rely upon their own capabilities for coping with isolated attempts at destroying their matériel. Under no conditions would it be permissible to remove troops from the fixed defences to remedy deficiencies on the land side, unless, indeed, things had come to a desperate crisis, or the enemy's powers of raiding by sea were known to be very greatly crippled. There is the greatest risk of the enemy attempting an attack from two points, or of making a feint on one side to cover the real attack on the other. The naval base is so vulnerable that even a few light or medium howitzers might in a few hours by means of observed fire do endless damage to the magazines and shops of any naval arsenal. The tactics of the defence must be essentially prudent, and correct intelligence of the enemy's movements must be sought after above all things.

This, however, is becoming a purely tactical question, but a consideration of the subject from this point of view is necessary in order to show that a coast fortress commander can hardly be expected to consider his fortress as a strategic "pivot of manœuvre from which he can launch his strokes in any required direction," when the entire garrison he can muster is only sufficient to parry an enterprising raid on the naval base protected by his fortress. It is the protection of this base which is his one and only duty, and by successfully protecting that base he will be more effectually fulfilling his duty towards the army, the navy, the Country, and the Empire, than by indulging in strategical schemes that might lead to the total loss of the base.

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Recent Changes in the Royal Regiment of Artillery.

By Major J. H. LESLIE, Royal Artillery, (Retired List).

WHENEVER a regiment of Cavalry or Infantry is raised or disbanded, the fact is notified in Army Orders, but in the case of the R.A. no such notification is made. Units of R.A. are raised and disbanded without any public intimation of the fact being given.

During the last four years 16 units of Royal Artillery (batteries, companies and dépôts), have been reduced, and only one company raised.

The reduced units are as follows:—

R.H.A.	1 dépôt.
R.F.A.	1 battery. 3 dépôts.
R.G.A.	1 battery (Mountain). 1 dépôt (Mountain). 7 companies. 2 dépôts.

One battery (Mountain), R.G.A. has been converted into a company R.G.A., and one company R.G.A. has been raised.

The total reduction in strength may be estimated roughly at about 2,100 of all ranks.

The following notes give the dates, authority, etc., for the various changes referred to above, in chronological order.

1903.

Army Order 57. para. 4, of 1903.

"No. 4 Mountain Battery, Royal Garrison Artillery, will be converted into a Siege Train company on its arrival from Egypt, becoming No. 106 (S.T.) Company, Royal Garrison Artillery."

The battery, however, did not reach England until March, 1905, and it was then *reduced*—June 27. (W.O. Movement Notice, No. 9 of 1905).

Consequently No. 106 Company, R.G.A., *never came into being at all.* It is well to notice this fact, because in the future it will be

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difficult to find out the why and wherefore of the non-existence of such a company, as the Army Order quoted above has never been amended.

No. 4 Mountain Battery, R.G.A., appears for the last time in the Army List of June, 1905.

The same Army Order (No. 57 of 1903) continues:—

"No. 10 Mountain Battery, Royal Garrison Artillery, will on "arrival from South Africa, be similarly converted and become No. "107 (Siege Train) Company, Royal Garrison Artillery."

The Battery arrived in England on April 3, 1903, and became No. 107 Company, R.G.A., with effect from April 1, 1903, and it appears as such for the first time in the Army List of that month.

The Army Order further says:—

"The Dépôt at Newport will be abolished simultaneously with "these conversions."

The Dépôt referred to is, of course, the Mountain Division Dépôt, R.G.A. It was reduced in May, 1903, and appears for the last time in the Army List of that month.

1904.

A company, No. 108 (Heavy), R.G.A., was formed (War Office letter No. 20/Artillery/2999(A.G.8.) dated March 28, 1904) at Gosport, with effect from June 1, 1904, and appeared in the Army List of May for the first time.

1905.

151st battery, R.F.A., was reduced on May 31, (War Office Movement Notice, No. 9 of 1905), and appeared for the last time in the May Army List.

Nos. 98 and 103 companies, R.G.A., were reduced on December 5 and 6, respectively (War Office letter No. 120/Gen. No./6369 (A.G.6) dated February 6, 1906).

These two companies appeared for the last time in the Army List of November 1905.

1906.

No. 92 company, R.G.A. was reduced on February 28 (War Office Movement Notice, No. 8 of 1906).

It appeared for the last time in the Army List of January, 1906.

"B" Dépôt, R.H.A., was reduced on June 7 (War Office Movement Notice, No. 10 of 1906).

It appeared for the last time in the Army List of May, 1906.

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No. 58 company, R.G.A., was reduced on July 9 (War Office Movement Notice, No. 11 of 1906).

It arrived from Esquimalt at Liverpool on June 1, and appeared for the last time in the Army List of May 1906, though shown in the R.A. Regimental List until August.

A change took place this year (Army Order 161 of 1906) in the designation of the Siege Train companies, R.G.A. Their designation in future was ordered to be "Siege Companies, Royal Artillery."

The companies affected by this order are Nos. 23, 39, 68, 94, and 107.

1907.

No. 53 company, R.G.A., was reduced on February 28 (War Office Movement [illegible] No. 15 of 1906).

It appeared for t[illegible] time in the Army List of October, 1906, but was shown in the R[illegible] Regimental List until February, 1907.

Nos. 2, 3, and 7 Dépôts, R.F.A., at Glasgow, Weedon, and Preston, respectively, were reduced on March 1, 1907 (War Office Movement Notice, No. 2 of 1907).

These units appeared for the last time in the Army List of February, 1907.

At this time there existed 7 Dépôts, R.F.A. Nos. 5 and 6, became Nos. 2 and 3 respectively, at Templemore and Seaforth, when the latter were reduced (Army Order No. 32 of 1907).

Nos. 4 and 5 Dépôts, R.G.A., at Seaforth and Scarborough, respectively, were reduced on March 1 (War Office Movement Notice No. 2 of 1907).

They appeared for the last time in the Army List of February, 1907.

At this time there existed 6 Dépôts, R.G.A., and when No. 4 was reduced, No. 6 became No. 4, at Great Yarmouth (Army Order No. 32 of 1907).

No. 25 company, R.G.A., was reduced on July 15, 1907 (War Office Movement Notice, No. 9 of 1907).

It appeared for the last time in the Army List of August, 1907, as "Being disbanded."

No. 27 company, R.G.A., was reduced on August 1, 1907 (War Office Movement Notice, No. 9 of 1907).

It appeared for the last time in the Army List of August, 1907, as "Being disbanded."

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Table showing the 16 units of Artillery which have been reduced between the years 1903 and 1907.

Corps.	Designation when reduced.	Date of reduction.	Date of formation.	Designation when formed.
Garrison	Dépôt Mountain Division	5 1903	1899	Dépôt Mountain Division, R.G.A.
Field	151st Battery	31 5 1905	1901	151st Battery, R.F.A.
*Garrison	4 Mountain Battery	27 6 1905	1770	5 Company, Bengal Artillery.
Garrison	98 Company	5 12 1905	1808[1]	Captain James Addams's Company, 10th Battalion.
*Garrison	103 Company	6 12 1905	1765	4 Company, Bengal Artillery.
*Garrison	92 Company	28 2 1906	1806	Captain John May's Company, 9th Battalion.
Horse	"B" Dépôt	7 6 1906	1863[2]	Dépôt, Horse Brigade.
Garrison	58 Company	9 7 1906	1886	10 Battery, 1st Brigade, Northern Division, R.A.
*Garrison	53 Company	28 2 1907	1705[3]	Not known.
Field	2 Dépôt	1 3 1907	1900	2 Dépôt, R.F.A.
Field	3 Dépôt	1 3 1907	1900	3 Dépôt, R.F.A.
Field	7 Dépôt	1 3 1907	1900	7 Dépôt, R.F.A.
Garrison	4 Dépôt	1 3 1907	1859	7 Battery, Dépôt Brigade.
Garrison	5 Dépôt	1 3 1907	1860	11 Battery, Dépôt Brigade.
Garrison	25 Company	15 7 1907	1802[4]	7 Company, 3rd Battalion, Bengal Artillery.
Garrison	27 Company	1 8 1907	1794[5]	Royal Irish Artillery.

[1] Reduced in 1817, and reformed in 1847 as 3 Company, 10th Battalion.

[2] Reduced in 1873, and reformed in 1900 as "B" Dépôt, R.H.A.

[3] 1705 is the "official" date of formation. It is obviously incorrect, as there was no establishment of Royal Artillery until 1716, in which year two Companies were formed, by Royal Warrant dated, May 26, 1716.

[4] Reduced in 1871, and reformed in 1900 as 30 Company, Western Division, R.A. (Army Order 112 of 1901.)

According to Major-General F. W. Stubbs's "History of the Bengal Artillery," this Company was raised in 1818, as No. 8 Company of the 2nd Battalion, and became No. 7 Company, 3rd Battalion, in the same year.

[5] Reduced in 1819, and reformed in 1900, as 31 Company, Western Division, R.A. (Army Order 112 of 1901.)

One cannot help feeling great regret that it has been found necessary to reduce units with a long and honourable record of service.

Each of the four, which are marked with a star in the above table, had *more than 100 years consecutive service*—now consigned to oblivion. A little consideration would have prevented this sacrifice, without causing any extra expenditure of public funds, for the most recently formed units could have been reduced, and replaced at their respective stations by those which unfortunately have now actually been reduced.

Esprit de Corps and tradition, in spite of the modern idea, still stand for all that is best, and although, as in 1901, the Services and Traditions of reduced units may, by virtue of an Army Order, be revived and assigned to newly formed units, the break in continuity of existence can never be *really* healed.

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DAVOUT.

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NAPOLEON'S MARSHALS.

2. DAVOUT.

By CAPTAIN H. M. DAVSON, R.H.A.

LOUIS Nicolas Davout was born at Annoux, Yonne in Burgundy, on May 10th, 1770. He was of gentle birth and was educated with Napoleon at the Military school at Brienne and was a gentleman cadet at the Ecole Militaire at Paris with the rank of Sub-Lieutenant.

His father was Chevalier and Seigneur of Annoux, and in 1788 obtained for his son the post of Sub-Lieutenant in the Royal Company of Cavalry. This Davout resigned in '91 and became Lieutenant Colonel of the 3rd battalion of the Volunteers of Yonne, and in '92 commanded a battalion under Dumouriez.

He subsequently became Adjutant General of the army of the North, Brigadier of the army of the Cotes de l'Océan and General of Division of the army of the North.

His leanings as a noble caused him to resign this in 1793.

Next year when Frenchmen began to sink their differences against a common enemy, he commanded a division in the army of Brest, and was subsequently transferred to a like post in that of the Moselle, and ultimately to the cavalry brigade of that army.

Next year he served on the Rhine under Pichegru and Moreau, and in '98 went with Napoleon to Egypt and distinguished himself at the battle of Aboukir, July 5th, 1799.[1] His part here can only be described as subordinate. and it was not until he returned with Desaix after the battle of Heliopolis, March 20th, 1800, that his career may be said to have begun.

In 1800 he commanded a cavalry division in Italy and at once lost his friend Desaix.

Next year he married Mlle. Aimée Leclerc, daughter of a rich mill owner of Pontoise and sister of the General of that name, the first husband of Pauline Bounaparte. He thus became connected by marriage with the Pro-Consul who made him in succession Chief of the Secret Police, General of the Consular Guard, Commandant at Bruges and Colonel General of the Grenadiers of the Guard. In May, 1805 he was made a Marshal of the Empire and later in the year commanded the 3rd Corps of the Grande Armée at Bruges.

This Corps, which was probably the finest in the Imperial Army, fought from now without intermission for several years until, as the 1st Corps, it ceased to exist in 1812. We owe most of our know-

[1] This was Napoleon's battle against the Turks and must not be confused with Abercromby's victory over Friant in 1801.

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ledge of its deeds to the journal kept by Davout himself,[1] and certainly the results of its fighting in 1805-6-7 seem well worthy of the praise its commander lavishes on it.

Marching from Bruges, Davout crossed the Rhine at Mannheim, and advancing by Neckar-Els and Oetingen struck the Danube at Neuberg, halfway between Ulm and Ratisbon, and formed with Marmont's Corps the centre of the French. He then moved South by Aicha on Munich, but took no decisive part in the capitulation itself. His Corps united to Lannes and Soult under the direct orders of the Emperor, now crossed the Inn at Braunau, and in the subsequent advance he chased Merfeldt to Mariazell and defeated him there.

The next action of importance in which the 3rd Corps was engaged was Austerlitz on December 2nd.

In order to appreciate the part played by Davout in this memorable fight it is necessary to give a brief explanation of Napoleon's dispositions.

The Emperor had advanced from Vienna towards Olmutz and gave battle to the combined armies of Austria and Russia in a position East of Brünn facing East behind the Goldbach Stream, his left (Lannes) resting on the heights of Rosnitz Berg, and his right slightly refused on the Abbey of Raijern. The idea of the Allied Emperors was to turn the French right flank, thus severing Napoleon's communications with Vienna. As a matter of fact Napoleon had an alternative line through the Bohemian mountains on Ratisbon, but the Allies were unaware of this, and did not pause to consider whether such a master of war would be likely to leave an important flank so—as it appeared—weakly held. Napoleon massed Lannes, Murat, Soult and Bernadotte on his left, with the Guard under Bessières in reserve, and ordered Davout to hold the defiles over the Goldbach at Telnitz and Sokelnitz. During the night Napoleon watched the movements of the Allied Corps southwards by their lights, but when they in the morning, having forced the passages of the stream, expected to roll up the French right, they found the whole of Davout's Corps in front of them, which held its ground while Lannes and Soult drove everything before them from the other flank. So much did the Emperor appreciate the fight which Davout was to wage that he attached all Soult's cavalry to his Corps as well as eighteen squadrons from the reserve, which acted on the Vienna road.

The much exaggerated tales of Davout's artillery breaking the ice on the frozen lakes of Satschan are well known. Whether such great losses were really suffered by the Allies is open to doubt,[2] but at any rate they lost about 30,000 men in the battle, and were forced eventually to conclude the humiliating peace of Pressburg.

The year 1806 seemed to be passing quietly for the French, when towards the end of it the expected rupture with Prussia took place. Whether this was the fault of Napoleon or the King of Prussia it is not in the province of this essay to discuss, but it is sufficient to say that the Emperor delayed operations until September,

[1] Les operations du 3me Corps,
[2] The lakes are now dried up ponds.

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thus giving his rival every opportunity of uniting his forces and forming a plan of campaign. When the Prussians finally declared war the French were scattered on, and to the South of, the Main, in fact we may say that they extended from Paris, where the Guard was, to Amberg near the Bohemian mountains, where Soult was. Davout himself was at Bamberg on the Main.

Having found that it was to be war, Napoleon lost no further time. The rate of marching of the French Corps in the early part of October is astonishing. The 3rd Corps started its march behind the 1st and marched 14½ miles the first day, 19 the second to Ollersdorf, 14½ the third, and 19 the fourth, and then a forced march of 28½ miles to Naumberg. It is not known why this was, Bernadotte was nearer Naumberg than Davout, but Napoleon ordered the Corps to cross there leaving Davout at the exposed corner. Presumably he had more trust in Davout if an emergency should arise than in his brother Marshal. Subsequent events proved the correctness of his view.

On the 13th, Davout's advanced troops crossed the Saale and occupied the heights of Kösen during the night, and at 6.30 a.m. on the 14th, Gudin's division crossed the river and advanced up the slope to Hassenhausen, whilst a small force went ahead to reconnoitre the plateau.

This force moving in the fog came suddenly upon the Prussian advanced guard and was forced back. Gauthier's brigade, which was afterwards destroyed at the passage of the Bug, pushed forward and received the full force of a cavalry charge from Blücher; Gudin then pushed his division up in line near Hassenhausen and for a time the line was exposed to fierce attacks from the Prussians between Punscherau and Speilberg till the advance of Friant at 8.0 a.m. relieved the pressure on the French right and forced Blücher's troops off the field. Bernadotte with his Corps was meanwhile making the best of his way to Dornberg where Napoleon had previously called him. He saw the uphill fight in which his brother Marshal was engaged, but preferred to think the Emperor's orders prevented him from giving assistance. We may suppose the usual jealousy of the Marshals stood in his way, or else he did not covet divided glory.

Morand's division, less two battalions left to guard the bridge, came up at 10.0 a.m. and Davout sent it to support Petit, who was suffering severely on the left of Hassenhausen. The two French wings now forced their way forward; Friant on the right captured Speilberg and then Zeikwar and seized an artillery position on the heights above Poppl, whilst Morand fighting steadily up the banks of the Saale and Ilm forced Rehausen and placed his artillery at Empsen Mill. The Prussians were now in danger of being shut in by the French wings, and General Kalkreuth made an effort to restore the day by attacking, assisted by the reformed cavalry of Blücher. The French guns played on both his flanks and forced him behind Gernstadt, and he rejoined the other divisions at Eckartsberg about 4.0. p.m. Davout's troops were so battered that a close pursuit was out of the question, and the Prussians withdrew in search of Prince Hohenlohe, who was then being soundly beaten at Jena.

Davout's Corps amounted to 25,000 men, and with them he

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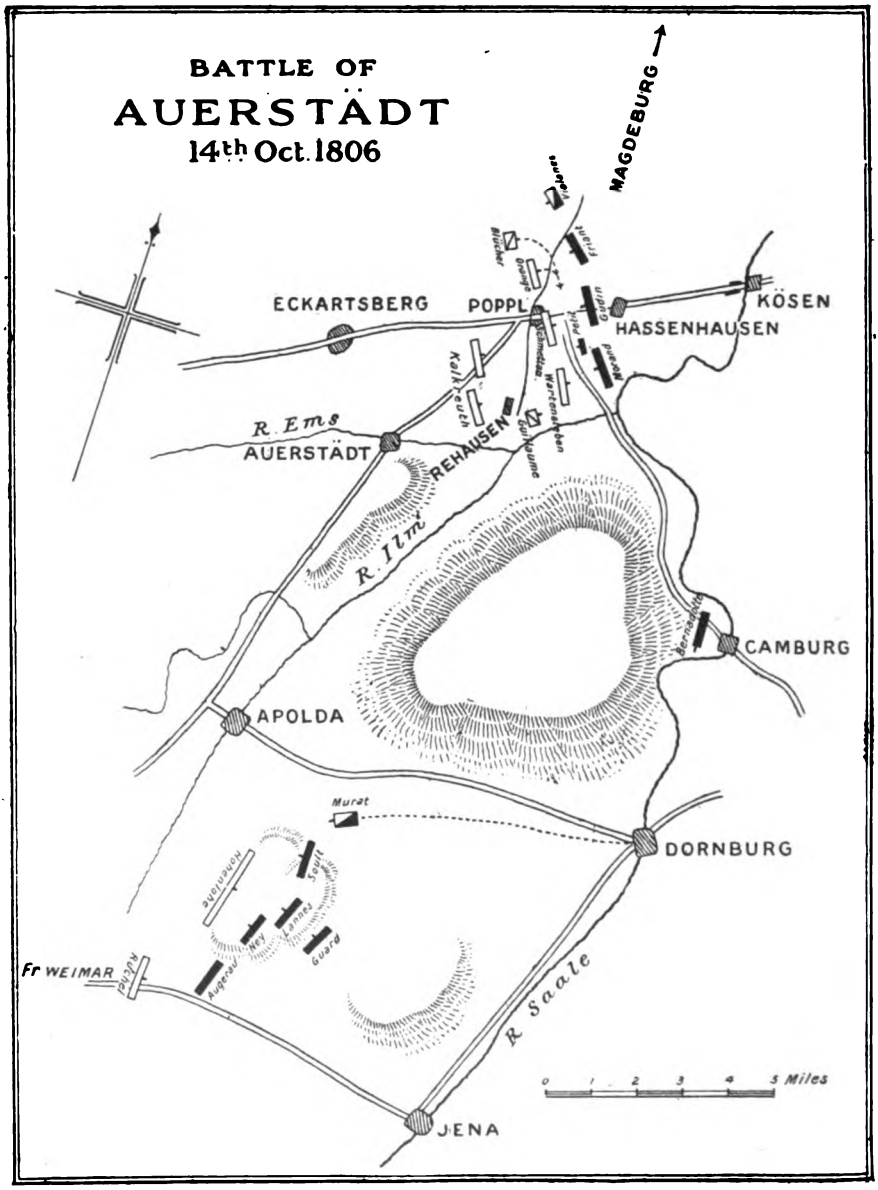
engaged and defeated 66,000 Prussians of whom 426 officers and 10,000 men were killed and wounded, including the Duke of Brunswick—the father of "Brunswick's fated chieftian" killed at Quatre Bras[1]—who was killed, General Schmettau who died of his wounds next day, and General Mollendorf. The French captured 3,000 prisoners and 100 guns, and they themselves lost 252 officers and 6,581



1 "His heart more truly knew that fatal knell
Which stretched his father on the bloody bier."—*Byron.*

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men killed and wounded including General Morand who was hit in the left arm.

Such was the battle of Auerstadt. A battle which raises Davout to the fore front of tactical commanders and reflects the highest possible credit on the fighting powers of his troops. The Emperor created him Duke of Auerstadt, but otherwise never openly gave him full credit for his victory. He preferred the world should think of Jena as the greater fight of the two. That he well knew Davout's worth, however, is proved by the fact that afterwards he generally commanded the largest Corps in the army.

As a reward for Auerstadt the 3rd Corps led the entry into Berlin on October 25th. Advancing thence it crossed the Oder at Frankfort whilst Gudin's division, which had been detached, captured the fortress of Kustrin a little lower down the river without striking a blow. This capture included 3,000 men, 500 guns, and a large sum of money.

Davout's advanced guard entered Posen, the capital of Poland, on November 4th. He then advanced to Warsaw, and entered it behind Murat's cavalry on December 1st, and on the 10th forced the passage of the Bug and afterwards the Wkra in face of the Prussians. The latter operation which was conducted under Napoleon's own orders, dictated to his subordinate from the top of a haystack, was carried out by the 3rd Corps by night with a smartness and accuracy that would have done credit to most troops moving in daylight.

On 26th December, the 3rd division under D'Aultanne was despatched in the direction of Pultusk to prevent a large Russian force falling on the 5th Corps which was there. D'Aultanne having driven the Russian cavalry back on Moszyn, found Lannes hotly engaged at Pultusk and formed up on his left. These troops fought this severe action and bivouacked on the battlefield in the snow, having marched and fought all day over a country knee deep in mud. Hearing that the Russians had retired across the Narew in the night, D'Aultanne marched at daybreak next day to rejoin Davout. Meanwhile Davout himself with the 1st division was engaged at Golymin in a fight which ended in the defeat of the Russians who retired on Australenka. His casualties in these two battles were 700 killed and wounded.

A month later, on the advance of the Russians to Heilsberg, Davout began his march towards Eylau. His advance was delayed by the enemy's light troops, and it was not until the battle was well commenced that he made his presence felt by attacking the village of Serpallen on the Russian left. Resting his left on St. Hilaire's[1] division of Augerau's Corps, he fiercely attacked Klein-Sausgarten thus threatening the enemy's left rear. Although at first successful he was forced to abandon the village, but all the force of the Russian guns and cavalry could not make him abandon the attack, and General Friant finally occupied the place. General Lochet, the hero of this part of the fight, having fallen mortally wounded. This forced the Russians to abandon their attacks on Serpallen and to retreat to Anklappen followed by the victorious Friant. Forcing his way

[1] Killed in 1809.

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through the wood of Serpallen, General Gauthier captured the hamlet of Anklappen and drove the enemy to Kutschitten. At this point Davout's Corps, much weakened by heavy losses, was near to being rolled up and destroyed. He himself ran through the ranks putting heart into his tired soldiers. "The brave," he cried, "will here find a glorious death; the cowards will visit the deserts of Siberia." Aided by the artillery which he massed on the small hills North of Serpallen he withstood all the Russian attacks until 10 o'clock at night when the Prussians retired on Friedland and the Russians on Konigsberg. His troops slept in the snow on the battlefield, fierce storms of which had blown in the face of the French all day. Davout's losses amounted to 3,900 officers and men killed and wounded and about 300 prisoners. This fight on the French right affords a remarkable proof of the assistance well handled artillery can afford to infantry, both in attack and defence, and Davout took great pains to compliment General Hunicque, who commanded the guns, on the high spirit which all ranks had shown.

From now until the Peace of Tilsit he was employed in strategic movements, and took no part in the battles of Heilsberg and Friedland.

On July 12th, 1807, he was made Commandant of the Grand Duchy of Warsaw and Governor of Poland. The country was seething with revolt, but Davout's measures to repress it were so severe that he left a reputation of harshness behind him perhaps not altogether deserved.

Next year he commanded the army of the Rhine.

In 1808, Davout was created Duke of Auerstadt, and continued in command of his Corps which had remained in Germany. On relations becoming strained between France and Austria in 1809, he concentrated 60,000 men at Bamberg, and on the declaration of war in April he made his famous flank march up the Danube bv the Abach Defile to join the Emperor at Abensberg, during which he fought the interesting action at Thann, having left a single battalion to guard Ratisbon. The columns marched in the following order:—(1) St. Sulpice's cuirassiers, baggage and artillery parks, (2) St. Hilaire and Morand, (3) Friant and Gudin. St. Hilaire was stopped at Tengen and took up a position between Tengen and Hausen; Friant in front of Schmelhof to support St. Hilaire. Morand and Gudin marched by Burchdorf on Arnhofen and joined the Bavarians. Hohenzollern attacked Hausen, took it and tried to force Tengen which brought on the battle which lasted all day. Two thousand Austrians were killed and Davout slept on the battlefield.

Davout's despatches and letters at this date show fully how conscious he was of Berthier's errors in separating the Corps along the Danube, dispositions which, but for the timely arrival of Napoleon and the beautifully conducted march alluded to above, would probably have ended in irretrievable disaster. An amusing sequel to this took place when the army returned to Paris. Davout appeared at a reception wearing a handsome Polish order which excited the envy and admiration of Berthier, who ended by expressing a desire to have one like it. "My dear Berthier" replied Davout, "it is per-

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fectly easy, all you have to do is to win a battle." The sally was much appreciated by the onlookers, most of wnom, like Davout, had suffered through Berthier's mis-management.

The day following Thann, was fought the battle of Abensberg, which cut the Austrians in two. The Emperor pushed one portion to Landschut leaving Davout to hold the other, which he accomplished.

The Archduke Charles, having seized Ratisbon, attemped to cut the French communications with the Danube. Davout threw himself upon their right and captured the villages of Unterleichling and Oberleichling in a fierce hand to hand contest, whilst the Emperor arriving from Landschut came up on their left. The Archduke was then driven across the Danube at Ratisbon.

For the two days fighting on April 20th and 21st, Davout received the title of Prince of Eckmühl.

Napoleon now pushed on to Vienna, whilst the Archduke pushed on down the left bank of the river and prepared to dispute the passage.

Davout took no part in the first day of the battle of Aspern, and only a small one on the second, as owing to the breaking of the bridge over the Danube, most of his Corps was compelled to remain at Ebersdorf on the right bank.

Then followed the six weeks wait in Vienna, from 23rd May to 4th July, and on the afternoon Napoleon began his second passage of the Danube.

This time Davout was on the right of the line, and on the following day, when the battle of Wagram commenced, his Corps was about two miles South of Gluzendorf. The result of the battle hung long in the balance, as the French were checked in the centre, but Davout finally captured the village of Neusiedel, and pressing along the low hills East of the Russbach—a small stream which crosses the Marchfeld from N.W. to S.E.—he forced back the Austrian left flank and allowed Napoleon to gain possession of the village of Deutsch Wagram which occupied the highest ground in the neighbourhood and was the key of the position. The fight on the French right for what are usually called "the heights" but which are really a succession of low eminences unnoticeable from a distance, culminating in the plateau of Wagram, compared to which Primrose Hill is a mountain, was very severe and it tried the courage of Davout's troops and his own reputation very highly to obtain the upper hand of the force against him.

Five days afterwards the armistice of Znaim put an end to the fighting in the campaign.

Napoleon returned to Paris after the Peace of Vienna, and Davout was created (January, 1810) Chief of the Army of Germany —which was followed later in the year by his appointment as Governor of Hamburg, and President of the Commission of Organization of Ems-Superieur and Bouches du Weser and Bouches de l'Elbe, which comprised 32 military divisions.

On 15th August, 1809, he was created Prince of Eckmühl, and later was one of those chosen to accompany the body of Lannes from Vienna to Paris where it was interred in the vaults of the Pantheon.

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Davout recited the funeral oration over his dead friend finishing with these words:—

"We will follow the example which the Duc de Montebello has "left us; we will steep ourselves in his zeal, his devotion, his courage "and we will always be ready to shed our blood for the service and "glory of our great and beloved Emperor."

He and most of his hearers carried these words out to the letter.

In November, 1810, he was made President of the Electoral College of the Côtes d'Or, and on travelling to Dijon to assume his duties he found time to stop at Auxerre and visit his old schoolmaster, one Laporte. It is a good example of the man, showing how little his glory and the honours heaped upon him had spoilt him.

Another tale comes from Paris to the same effect. Davout had bought an hotel in the Rue St. Germain and immediately a man of the same name bought an hotel close by—put his name on the door and then came to the Prince of Eckmühl and offered to clear out for a consideration. "My friend" said the Prince, "I have no objection to our living close together. If so be we are relations we must have started at the same point, since then, it appears, we have taken different ways."

In 1811, he was made Governor of the Hanse towns and Chief of the fortresses on the Vistula, Oder, and Rhine.

He left behind good memories of his administration which is all the more to his credit seeing that it was a post of a nature rarely if ever given to Marshals.

Being in command in Germany at the outbreak of hostilities in 1812, it was confided to Davout to form the magazines for the advance into Russia, and his Corps became the advanced guard of the army.

This does not appear to have been either a happy or fortunate campaign for him. He distrusted it from the first, and when the army reached Smolensk he prayed the Emperor to turn back.

Napoleon was doubtless of opinion that this was the best course, but he yielded to his own inclinations and to the wishes of Murat, and continued the campaign.

Davout lost his Lieutenant, Gudin, at Stabna, the man who had supported him in many a hard fought fight, owing to a cannon ball shattering his thigh, and he himself was badly wounded at the battle of the Moskwa. Disunion spread amongst the Marshals, and Davout was continually at variance with Murat, and finally came under the displeasure of the Emperor himself. It would appear as if the anxiety and privations of the campaign had a bad effect on a nature which was at all times impatient.

The result was that his ideas as to the line of retreat—sound ones as proved by subsequent events—were not listened to; fault was found with his handling of the rear guard, and on the 3rd November he was relieved by the Corps of Ney. He finally fell out with Murat at Wilna and was recalled to France.

He stemmed the Russian advance in Germany next year (1813) and drove them behind the Elbe. In May he took command in Hamburg; captured Mecklenberg on the outbreak of hostilities, and formed a large entrenched camp at Steknitz.

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On the arrival of Bernadotte and the army of the North, he was blockaded in Hamburg which he held successfully and refused to surrender even on the abdication of Napoleon. He announced himself as holding the town for Louis XVIII. and France, and defeated an English flotilla sent against him.[1] He finally handed over the command to General Gerard in May, 1814, and retired to his home at Savigny-sur-Orge.

Paris was forbidden him and he was the subject of political jealousies and denunciations concerning his conduct at Hamburg. The chief one being that he had enriched himself at the citizens expense. He published a strong denial of this, and also a memorandum showing how the funds of the City had been expended during his Governorship. Some time afterwards leading citizens of Hamburg wrote supporting Davout's statements.

Napoleon returned in 1815 and sent for Davout who met him in the Tuileries. This was the first time the Emperor and the Marshal had met since the departure of the former from his beaten army at Smorgony in 1812.

Davout, much against his will, was created Minister of War. The work required of him and performed by him was enormous, but it is a question whether this man of arms would not have been of more use to his master on the field of battle. He certainly thought so himself, and it cannot be denied that Commanders of his stamp were rare in Napoleon's army in 1815.

On the defeat of the Imperial Army he went into exile, but after a brief space he took the oath of allegiance to Louis XVIII. and received the baton of Marshal in 1817. In 1819 he was made a Peer of France.

The rest of his life is uneventful, but he was said to have never been the same after the death of Ney at whose trial he was forced to take a prominent part.

He suffered latterly from an affection of the chest, and although he combated his illness with the same courage that he had displayed against his master's enemies he finally succumbed to it in Paris on June 1st, 1823.

He was buried in the Cemetery of Pere-Lachaise, and the remnants of the 3rd Corps—alas, how few they were—gathered from all parts to do him honour.

He left four children, a son who succeeded him, and on whose account he had taken the Royalist oath, and three daughters, who became Mme. Vigier, la Comtesse de Cambacéres and la Comtesse de Blocqueville.

[1] The only time he met British troops except at Acre.

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The Initiative in National Strategy.

By MAJOR C. ROSS, D.S.O., *psc.*, NORFOLK REGIMENT.

(A Lecture delivered at the Royal Artillery Institution, Thursday, 31st October, 1907).

Colonel H. V. Cowan, C.V.O., A.-D.-C., in the chair.

THE CHAIRMAN: Ladies and Gentlemen, Major Ross has kindly come here this afternoon to lecture to us on "The Initiative in National Strategy." I will now ask him to begin his lecture.

THE LECTURER: Colonel Cowan, ladies and gentlemen; it is probably, clear to most students of war, who regard hard historical facts as they are and not through rose-coloured spectacles, that nations, like wild animals, are ever at war in the struggle for existence, and that the one great principle of success is to overpower the enemy by brute force. The pages of history would seem to point to the fact that war between nations, as well as war between animals, arises from the predatory instinct, from the desire to be fat and well fed, from the desire to guard the security of the young. War to-day is as much a matter of teeth and claws as it was two thousand years ago, and as it is, at this present moment, in the jungles of India and Burmah. The chief difference which exists between ourselves and wild animals in this matter of war, is that we have learned to strike our enemies at a distance—so to speak, to shoot our claws at them. But even this accomplishment is not confined to the human animal; the jelly-fish is fitted with harpoons, each with a little coil of rope attached, and which he strikes at anything that comes within range. Every animal in the world must be—if he would exist—a master of strategy, tactics, and strategem, which terms merely signify the methods by which teeth and claws may be employed to the best advantage.

It is obvious that if you can pounce on your enemy unawares, you have gained more than half the battle. All predatory animals seek to do so; and, judging from history, many nations, and all great leaders without exception, have recognised that the ability to do so is the one great secret of success. We have many instances throughout history, but the clearest illustrations of all, perhaps, are to be found in the two last wars which have been fought.

There are those, however, who refuse to see facts as they exist, who prate of humanity and chivalry in war, and who indulge their sentiment at the expense of their compatriots who are fighting their battles for them in the field. Humanity, like charity should, one would think, begin at home, and when once war is engaged, whether

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that war be righteous or unrighteous, every man worthy of the name should surely devote his utmost efforts to bringing it to a successful termination, for otherwise the women and children of his own nation will be the very first to suffer.

The illustration afforded by the Russo-Japanese War:—

It was in 1894, at the termination of the war between China and Japan, and at the moment when Russia in alliance with France and Germany forced Japan to evacuate Port Arthur and Corea, that the Russian and Japanese Empires came face to face. On the one side, security as well as the vital necessity for expansion, and on the other, the demand for an ice-free port, coupled with ambition and prestige, would appear to have rendered war inevitable. The only hope that war might be averted lay in the possibility that Japan might permit herself to be ruined and absorbed in the Russian Empire without a fight. This she was not prepared to do, and as the only alternative, she commenced scientific preparation for the inevitable war.

It was fear, or at least expediency, which for the time being restrained these two antagonists. Russia was restrained from pushing her advantage, partly by her unprepared condition—the Siberian railway had not at that time been constructed—partly also, because she hoped to gain her immediate ambition by the peaceful occupation of Port Arthur and Corea, and partly owing to the contemptuous indifference with which she regarded her insignificant rival. It was to the Russian interest to delay the crisis until the Siberian railway had been completed, and until she was able to meet Japan single-handed, for allies demand payment from the booty.

It was obviously to the interest of Japan, fairly well prepared as she was, to force on the crisis while Russia was as yet unprepared; but she could hardly venture, with any hope of success, to attack Russia supported by Germany and France. It was necessary in the first instance to separate Russia from her allies, meanwhile completing the necessary preparations. Hence we see that the object of Japanese strategy was to isolate Russia; while the object of Russian strategy was to retain allies until she should be prepared to act effectively alone, and in the meanwhile to gain as strong a position as possible in the Far East—a position from which she could strike direct at the very centre of the Japanese power.

In 1897, Russia leased Port Arthur from China for a term of 25 years, and immediately commenced to fortify the place, and to construct a railway to connect with the Siberian railway. Japan did not even venture to protest.

In 1900, Russia, taking advantage of the Boxer rebellion, occupied the province of Manchuria, which brought her down to the borders of Corea.

In January, 1902, immediately prior to the termination of the Boer War, Japan concluded an alliance with Great Britain. By this alliance these two powers engaged to "keep the ring" in case its friend became involved in a defensive war in the Far East, and to assist its friend if the enemy received assistance.

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By this alliance Russia was isolated; for France could now only assist Russia provided she were prepared to face the prospect of a struggle with Great Britain. But France was by no means desirous of a conflict with Great Britain even in her own interests, much less in those of Russia; such a war was calculated to place her at the mercy of Germany. And neither was Great Britain inclined for a contest with France, for she had but just concluded a long and costly war in South Africa. Hence we see that as the danger of war became apparent to both nations, so did the efforts on both sides of the Channel increase to arrive at a complete understanding. These efforts finally resulted in the *entente cordiale*, which ensured that these two nations would confine themselves to an attitude of benevolent neutrality towards their respective allies. The neutrality of France ensured, for obvious reasons, the neutrality of Germany. Thus the conclusion of the alliance with Great Britain was a masterstroke of strategy on the part of Japan; and it meant that she was victorious in the first phase of the conflict with Russia.

From the moment it became certain that Germany and France would stand aloof, and, therefore, that Russia had been isolated, the second phase of the conflict commenced. The time had arrived at which the long prepared blow must be struck; Russia must not be permitted to complete her preparations; but at the same time, Japan must show clearly that the responsibility for the outbreak of hostilities lay with her adversary. Fortunately for Japan this was a matter of but little difficulty, for Russia had already made specific promises which she clearly had no intention of fulfilling, and which she could only fulfil with a complete surrender of the points at issue, and provided she were prepared to renounce the work of several years, and to suffer a loss of prestige which might well prove in the end but little less disastrous than a reverse to her arms. But Russia had no conception that she was about to experience a reverse to her arms. On the contrary, her contempt for the Japanese had undoubtedly been intensified by the extreme patience which had been displayed by the latter. So slight was her apprehension, indeed, that in the spring of 1903, when it was practically certain that she would obtain no assistance from either France or Germany, and when, therefore, she should have proceeded with the utmost circumspection, she not only refused to fulfil her promises, but elected to commence fresh aggression in Corea. Japan seized her opportunity and protested, reopening the whole question of Manchuria. Negotiations ensued in which Japan continued to display her remarkable patience. They lingered on until the end of the year, but it was not until the autumn, apparently, that Russia commenced to recognise the gravity of the situation. It will be within the memory of all how she then sought to delay the inevitable by every expedient of diplomacy short of actual submission, the while she hurriedly pushed forward her warlike preparations. Japan was, however, in so strong a position that she could afford to permit Russia to strengthen her forces, both land and sea, up to a certain point, in order that it might become apparent to all that her opponent was seeking to stave off a rupture, not with a desire for a peaceful settlement, but with a view

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to the completion of her preparations. Confident in her readiness, Japan was in fact, prepared to accept additional risks in order to prove to all that Russia was in the wrong. But these risks were after all not very great. It is true that a large Russian naval reinforcement was on its way to the Far East, that it had already reached the Suez Canal, and that the Russian fleet actually on the spot was, if anything, slightly superior to the Japanese in material strength. But material strength is not everything, and in general efficiency the Japanese were vastly superior to the Russians. This fact was, it is probable, very well known to the Japanese. But more than that, the Japanese fleet was concentrated, while the Russian fleet was separated between Port Arthur and Vladivostok. And again, a Japanese reinforcement of superior speed to the Russian was also on its way to the Far East, and it was merely necessary to wait until this reinforcement had passed ahead of the Russians.

It will thus be seen that the Japanese held the initiative both strategically and diplomatically; or in other words, had put the Russians in the wrong, and also disposed of superior force. The outbreak of hostilities was inevitable—merely a matter of time and of strategy, and this fact was, it is evident, perfectly apparent to both antagonists as it was to all on-lookers. The object of each one should, consequently, have been to suddenly and unexpectedly inflict a disastrous blow on the opponent. The decision of the first fateful engagement would depend far more on strategy, on surprise, on the display of secrecy in preparation and rapidity and resolution in execution, than on mere material strength.

While affairs were in this state of tension, Japan called for a reply to her last note. No reply was forthcoming, but instead of it, on the 3rd February, 1904, the Russian fleet left the inner harbour of Port Arthur and anchored in the open roadstead. This was a threat which must have come as a God-send to the Japanese, and of which they took instant advantage. On the 6th February, Japan telegraphed to her ambassador to sever diplomatic relations and to leave the Russian capital, and, practically simultaneously, she despatched her fleet to strike the first blow without further declaration of war. We all know the result of it; the Japanese inflicted serious loss on the Russian fleet, seized the principal harbour in Corea, and gained the power to transport troops with impunity across the sea for the invasion of the mainland.

It is doubtful whether the Russians, even had their leaders posesssed the same resourcefulness and determination as that displayed by the Japanese, could have attempted with much chance of success to strike a similar blow. It is true that their fleets at Vladivostok and Port Arthur were connected by telegraph, and that there existed no insuperable reason why they should not have made the attempt, at least, to strike simultaneously. But as we now know, the Japanese intelligence of the Russian movements was far too perfect to admit of much hope of success; and had the manœuvre been attempted, one portion of the Russian fleet would, without doubt, have been attacked by the whole Japanese fleet. Still it is a noteworthy fact that the report that the Russian fleet had put to sea from Port Arthur,

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roused considerable excitement in Japan, and if the attempt had really been made, it seems quite possible that the Russians would at least have avoided the blow they actually received. It is perhaps absurd for us to venture to speculate as to what the genius might have done in these circumstances. It is certain that he would have recognised that unreadiness is no excuse for failure to take the necessary action, but that it must at all costs be counter-balanced by the promptitude and determination with which the advantage of the initiative is seized. But nevertheless, it appears to us that even the genius would probably have failed in face of the Japanese efficiency. Or the genius might have surrendered the point at issue for the time being; but there is no reason to suppose that the Japanese would have acquiesced in so glaring an attempt to scramble out of a difficulty without demanding guarantees for the future. Or again, the genius might, possibly with better results, have sought merely to delay the outbreak of hostilities as the Russians actually attempted to do; but then again, the Japanese are not easily outwitted. On the whole, it seems to us that, even had the Russian genius arisen at this critical moment, he would probably have failed to rectify the mistakes in national strategy which had already been committed by the Russians—namely, that they had permitted themselves to be outpaced in preparation, that they had allowed their diplomacy to out-run their preparation, that is, that they had permitted the crisis to arrive before they were ready to meet it, that they had failed to train their officers and men rigorously in accordance with the dictates of modern war, and finally, that they had separated their fleet into two main portions. It seems quite improbable indeed, that the rise of a genius at the critical moment will, in modern war, when nations are organised as machines of war, compensate for defects in national organisation, training and strategy.

As far back as the 1870 war, it had become a military platitude that a prolonged course of scientific preparation in peace time was essential if brute force was to be successfully applied. The teeth and claws of modern civilised nations are instruments of extreme complexity, and constant effort is necessary, not only to keep them sharp and ready for use at a moment's notice, but to learn how to employ them to the very best advantage. Even if we admit that the genius is a man with an inborn capacity which enables him to employ the national teeth and claws to the very best advantage, yet he cannot off-hand, construct those teeth and claws; he cannot, any more than the ordinary man, accomplish the work of years in a few days.

But the genius failed to come to the assistance of Russia; and, as Captain Mahan writes, Russia, "inexcusably unprepared, and still more inexcusably off her guard, at a most perilous moment, lost the first and very important moves of the game." She lost more, she lost the power to assume the offensive; she was forced to stand and parry, while her adversary stepped forward and struck the blows by which alone success in war can be achieved.

The illustration afforded by the Boer War:—

It is interesting to compare the Japanese methods with those

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of the Boers in 1899. The task set the latter was incomparably simpler than that with which the Japanese were faced, for the opponent was not a nation which had recognised that an armed struggle was inevitable, or which had made any preparation worthy of the name. The Boer force immediately available was, beyond comparison, superior in numbers and mobility to the enemy, whose only available troops were, some two months before hostilities actually commenced, scattered in positions in which they would have been helpless to avert disaster. The key of the situation, the sea port of Durban, within easy reach of a sudden rush, was, unlike Port Arthur, unfortified and unguarded, and could not by any conceivable possibility have held out against a determined attack. The Boers had proved, to the entire satisfaction of the nations of the world, and even of a great part of the British nation, that Great Britain was in the wrong. But, apparently, they feared to precipitate hostilities at their own convenience, whether through the desire to gain further sympathy, through ignorance of strategy, through lack of unity of purpose, through a misplaced conscientiousness, or through a combination of all these, is not entirely clear. In any case, they neglected to act until their unready opponent had reinforced his troops at the decisive point; and when at last they moved, they did so in a half-hearted manner which speaks volumes for their ignorance of the science of war. Three months, or even three weeks, of the courageous and scientific Japanese leadership would undoubtedly have torn South Africa from its place in the scheme of the British Empire.

The question arises,—How is it, that of two vigorous and growing nations, somewhat similarly situated, each one about to pit its strength against a great Empire of vast resources with a view to wresting a portion of outlying territory from the grip of its opponent, and each one having made long and careful preparation, one could display scientific leadership, and seizing the initiative, strike a heavy and successful blow at the decisive moment, while the other, failing utterly to grasp the nature of the problem to be solved, missed its spring, and as a consequence, in the end suffered defeat?

It is undoubtedly the case that the national characteristics of the two peoples answers this question to a certain extent. The Boer, though at times bold to hardihood, was yet, usually, above all things, solicitous for his own safety, and it would seem that this national trait was reflected in the councils of the national leaders, and that these national leaders, ever glancing behind to see that retreat was sure, were incapable of accepting the risks which so conspicuously attend a bold offensive. For this reason alone success in war was indeed impossible to the Boer leaders. The Japanese, on the other hand, burning with an ardent patriotism, courts death on the battlefield as the noblest aim of manhood; and it would seem that this spirit of self-sacrifice and devotion to duty, without which no great deed can ever be accomplished, closely allied, as it was, to the power of scientific reasoning, was the mainspring which actuated the national leaders in their bold bid for victory.

But there is another point. The Boer nation as a whole, lacked unity of purpose. The Boers were in reality two nations under dis-

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tinct leaders; and though these leaders entered upon the war with practically identical designs, yet the people would not seem to have been fully educated to their point of view. The Boers were prepared to fight in self defence, but not in an aggressive spirit. The Japanese, on the other hand, had without doubt learnt from their German teachers that security is only possible with the destruction of the threatening power, that is, with an offensive, and the people had been fully educated to the necessity for an aggressive national spirit. It is always a matter of comparative simplicity to rouse a spirit of self-defence in a nation; the danger of invasion alone may be trusted to do so, though this danger very often does not become apparent until it is too late. But an offensive, or aggressive, spirit requires years of preparation and education, more especially in the case of a nation which professes the Christian religion. It can, however, be accomplished, provided a nation can be sufficiently educated in military requirements to understand the necessity for offensive operations. But the points we must note are, that without such knowledge, unity of purpose will be absent when the decisive moment arrives, and that without unity of purpose, a nation, more especially a democracy, cannot seize the initiative or strike the first blow.

Into the ethical aspect of this seizure of the initiative, I do not propose to enter. I would merely point out that unscrupulous attack is a pronounced feature of history. To offer the cheek to the smiter will generally prove disastrous if the adversary has the power and understands how to smite; to turn the other cheek to the smiter will assuredly prove fatal in modern war. It is surely sufficient to take facts, however unpleasant they may be, as they stand. There is, if anything, less chivalry in war than existed formerly. We no longer take off our hats to the enemy with the polite enquiry, "Gentlemen of the Guard, will you fire first"? We no longer, like Wellington at Waterloo, refuse to take a pot-shot at the hostile generalissimo; we no longer, like Mr. Snodgrass, take off our coats very slowly, and tell every one in a loud voice that we are about to begin. We seek to strike first, and consider ourselves fortunate if we can strike a decisive blow before the enemy is ready, or even while he is looking another way. The safety and comfort of our women and children will be considered by most men—fighting men at least, who know what war means—as ample justification for any lack of scruple we may choose to display. The only hope of a nation which desires to display chivalry and righteousness in its dealings with other nations, is to organise and train itself so perfectly as a machine of war, that it can afford to grant its enemy the inestimable boon of the initiative.

It is this first stroke which demands the highest moral courage in the leaders of a nation; it is this first sudden blow which is pregnant with victory or defeat; it is this first shock of battle which more clearly than ought else, enables us to gauge a nation's efficiency, the preparation it has undergone, the capacity and courage of its leaders, the devotion and discipline of its rank and file. An unsuccessful attempt not only brings the striker into disrepute throughout the civilised world, not only raises up a host of enemies whom fear has previously restrained, not only rouses the open expression of hostility

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amongst neutrals of which the adversary may be trusted to take full advantage, but enormously raises the prestige of that adversary, allays dissension in his ranks, fills all with an ardent patriotism and a savage hatred of the unscrupulous opponent, fully justifies him in any course of action he may think fit to adopt, and finally, grants him the opportunity for the delivery of a counter-stroke of which the possible results can by no means be foreseen. The delivery of this first blow is fraught with danger, for if the slightest inkling of the intention leaks out to the enemy, failure is almost inevitable. But the results to be hoped for from success far outweigh the dangers which must follow failure; the sudden seizure of the initiative is calculated to throw the opponent into confusion, to upset his premeditated plans, to confound his most secret and careful preparations, to make him the laughing-stock of the world—in a word, to upset the mental equilibrium of his leader, or leaders, which is, as the late Colonel Henderson has told us, one of the chief objects of generalship.

There can be no question but that in the wars of the future between civilised nations, victory or defeat will turn on the delivery of this first blow, and that nations, which are modern machines of war, and which are face to face in the struggle for existence, will eagerly seek for a pretext to strike suddenly and effectively. Success in this first blow is, however, impossible except with complete national efficiency; it demands perfect national leadership which knows how to avoid precipitancy or hesitation, which can ensure that diplomacy does not outstrip preparation, that the action taken is adequate to the end in view, that that end will materially assist towards the downfall of the enemy, and that adverse neutrals are checkmated by friendly neutrals. It demands perfect preparation which has arranged long in advance the means by which the blame shall be thrust on the opponent, which has established its organs in the press, not only of neutral territories, but in those of the enemy,with which to sway public opinion, which has thought out to the very smallest detail the manner in which the blow is to be delivered, and which has perfected and secretly holds in readiness the instrument—the teeth and the claws, driven by hardened muscles—with which that blow must be struck. Even as on the modern battle field, many days, or even weeks of preparation are necessary before the attack can be commenced, so in the domain of national strategy, many years of scientific preparation are essential to the delivery of a first telling blow.

But the first blow demands more than this, it demands the power of secrecy on the part of the nation as a whole, for without secrecy surprise is impossible, and secrecy can only be obtained where perfect national discipline exists, where the press is educated to the necessity for secrecy and is under control in all matters connected with war, where the enemy's spies and secret agents are helpless and marked down to a man or woman, where unauthorised means of communication are denied the enemy, where foreigners are registered and under supervision, where, in fact, all classes of the community, and not only those whose profession it is to carry arms, are prepared to undergo some little discomfort, and to submit to more or less stringent laws and regulations according to the nature of the

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crisis, in order that the chances of national success may be increased. But it also demands national organisation, for without it rapidity of action and, consequently, surprise are impossible. And, moreover, the first blow, whether it be on sea or land, must be followed by others; there must be no pause; the opportunity to recover must not be granted to the adversary, he must be beaten to earth by blow upon blow until he is driven to recognise that his hopes of ultimate success have dwindled to nothing, and that the only alternative to further disaster, or even national extinction, is the admission of defeat with all its train of bitter humiliation and misery. And a sudden and telling blow, or a rapid succession of blows, is possible only to the trained pugilist,—to the beast of prey, if you will—that is, to a national organism in which every muscle of the national body and brain has been taught and trained to act its part, in which all the various organs, the press, the business and political communities, the legislature, the Church, actuated by patriotism, have learned to subordinate their petty or local interests to the national aim. Success in this first blow demands perfect confidence between the national leaders and the masses; the former must act fearlessly according to their scientific judgment sure of the faithful support of the body of the people, and unhampered or undeterred in the execution of their duty by irresponsible criticism; while the latter, subjected of their own free will to the restraints of a salutary discipline, leave the conduct of affairs to the leaders, safe in the conviction that those leaders are the most capable men the nation can produce, and that if failure result, it will be because the national resources are unequal to the task, and not because they have been ill-directed. But such a nation is a machine of war.

It is no exaggeration to say that a democracy of which the people are untrained and uneducated in military matters, and of which the supreme leadership is in the hands of professional orators, trained solely with a view to cajoling the ignorant, cannot seize the initiative or strike the first blow. It cannot even make the necessary preparation in view of an inevitable struggle. It by no means requires the gift of prophecy to say that such a nation is fated to receive the first blow, and if its adversary be a modern machine of war, such as Germany or Japan, that first blow will, almost certainly, prove fatal. The British nation is in this position, and the most important problem with which we have to deal is, how can we constitute ourselves as a modern machine of war in the time available? We all know the difficulties which stand in the way of it—the absence of patriotism, the almost hopeless ignorance of war throughout all classes of the community, the extraordinary system of leadership—if it can be called leadership—which prevails.

It is probable that 90% of the educated sailors and soldiers of the country recognise that compulsory universal service is the only possible remedy. The number of the people throughout the country who also believe that some form of compulsory training is necessary appears to be increasing daily.

But there are two large and powerful classes of the community who appear to be the most strenuous opponents of anything in the

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nature of compulsion. These are politicians and socialists, the latter of whom may be taken to include socialistically inclined working men and the "unemployable." The arguments against compulsion are very well known. Put shortly, they are that compulsion is foreign to the traditions of the Englishman, and that conscripts will not fight as well as volunteers. The fact is entirely disregarded that about fifty per cent of the British sailors who fought under Nelson were pressed men. They were dragged on board ship by press-gangs, they were taken off merchant vessels, foreigners as well as British, they were even swept up from the gaols of the country. And yet, have men ever fought better than those British sailors? There is a vast amount of nonsense talked about this compulsion; a man will fight all the more bravely if he knows that he will certainly be shot or hanged, amidst the gibes of his comrades, if he runs away. If there is no such fear, men will run away. And, how can you, with any show of justice, punish a man for running away when 90% of his countrymen refuse point-blank to fight at all?

There is another argument which is commonly used against universal service, and that is, that young men, while serving, are withdrawn from productive employment. The fact is disregarded that their powers of production are vastly increased by training in manliness, in discipline, and in energy.

The true reason why these classes oppose compulsory training is probably—so far at least as socialists are concerned—to be found in the fact that universal service in the army and navy is hardly calculated to promote their own interests. The objects of socialists would seem to be a redistribution of property, by force if need be, that they themselves may benefit. It is but natural that they should object to universal service, for a national army is the best safeguard against the success of their endeavours. And again, we must recognise that so long as wealthy men can pay others to fight for them, it is unlikely that they will care to fight themselves, or to put their sons into the ranks. It is but natural that these classes should vehemently oppose compulsory universal service.

But we must not forget that there is a vast class in the country which necessarily includes all fighting men, whose interests lie in national efficiency. There are many who recognise the danger in which the country lies, and who have no wish to see their womenfolk and children reduced to utter misery and poverty either by socialists or foreigners. This class would quickly become overwhelmingly superior in numbers to the opponents of reform, if by any means, we could but bring the knowledge of the danger home to them. They would then quickly cry out to be trained for war; they would then quickly recognise the fundamental principle that it is a man's duty not to pay others, but to train himself for the defence of his women and children, that combination amongst the men of a nation, and the services of every available man, are necessary if the defence is to be successful. That is what patriotism really means, and the man who is unpatriotic is in reality, if he only knew it, a cur, who will not fight for his women and children.

But in the meantime, politicians, whose duty it is to take the

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initiative in these matters and to educate the people to the necessity for reform are the bitterest opponents of reform, and moreover have no time, apparently, to spare from their party squabbles for the consideration of such trifles as the problem of national security, and the safety of the women and children of the nation.

The question for us is, can British fighting men—sailors and soldiers, auxiliaries as well as regulars—do nothing in the matter? Is the poet's estimate of the soldiers duty a true one:—

> "Their's not to reason why,
> Their's but to do and die."

That is the sentiment which makes block-heads of warriors. If that estimate of the soldier's duty be taken as the true one, then without doubt, it is also our duty to sit still, thinking nothing, doing nothing, awaiting the millenium, and watching our country go under without an effort to save it while there is yet time. It seems a poor estimate of a man's duty, and one which will not be accepted by most men.

But if it be asked, what after all can we accomplish, and how is it to be done, is there then no answer? It seems utterly absurd on the face of it, to suppose that nearly a million fighting men, some more and some less trained, but nevertheless all fighting men, should be unable to sway, in the slightest degree, the destinies of a nation of civilians. It is absurd. If these fighting men can but arrive at a common understanding, they will certainly be in a position to educate very rapidly the bulk of the nation, and to coerce, if unfortunately it should become necessary, those classes which are opposed to reform.

There are those, however, who say that the nation will not learn until it is too late, and that, like the French in 1870, the people must experience the horrors of invasion before they will make any real attempt to introduce military efficiency. But even if this were true, are we sailors and soldiers thereby absolved from making any attempt to rouse our countrymen to a sense of their danger? Even now the political classes as well as the people appear to be awaking, and, without doubt, sailors and soldiers can if they choose, very materially hasten that awakening.

At present we are all of us waiting to see what sort of a response will be made to the appeal to the patriotism of the people in connection with the formation of a territorial army. But if that appeal is a failure, the sooner British fighting men move in the matter the better, for time is running short. And we should do wisely to bestir ourselves without delay to consider the most effective action we can take, and to make preparation accordingly. And the first step is to get into the closest touch with comrades in branches of the service other than our own, so that if it becomes necessary to take action, unity of purpose amongst the fighting men at least, shall not be lacking. Such unity of purpose may save the situation, it can do no harm, for it will furnish the best possible guarantee that these fighting men will fight to the last for their country.

It seems quite possible that we sailors and soldiers can, if we possess the energy and courage to attempt it, accomplish the regeneration of the nation in the time available. But we must display a high order of patriotism; we must understand that anything in the

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nature of self-seeking will necessarily prove fatal; we must, one and all, work towards the object in view; we must discard some of our pleasure and amusements and convince the people that we are in earnest. More than that, we must enlist the services of our womenfolk, for one pretty or charming woman, who makes no attempt to conceal her disdain for young men who are too cowardly to fight for women and children, will accomplish more in this matter than a dozen men. There are few men, worthy of the name, who do not fear more than anything else to face the contempt of women.

But if we are not prepared to do our best, we had best do nothing, we had best let matters rip, and resign ourselves to the probable verdict of history,—that the British nation went under because its men had ceased to be men, because they lacked the courage to use teeth and claws in defence of their women and children, because they were unworthy descendants of the real men who conquered and held our empire for us. Shall that ever be said of British sailors and soldiers? *(Great applause).*

DISCUSSION.

CHAIRMAN: I have now much pleasure in calling upon General Belfield to open the discussion. It is customary for the General to go first.

GENERAL BELFIELD: I had no intention of saying anything. The Lecturer has, of course, covered a very large field, and there are only one or two points I might touch upon. I do not propose to follow him into the question of universal service, or the latter part of the lecture, but there are two very definite points he seemed to bring out with the very greatest clearness, and which it is absolutely essential for us to bear in mind, whether we be civilians, sailors or soldiers, and in whatever rank of life we may find ourselves.

The first great point was to be able to strike the first and the most effective blow; but there are two points to bear in mind with regard to that, it seems to me, and one is to order the first blow, and the second is to carry it out and make it effective. It seems to me, in connection with the ordering of that blow, that the qualities, which the man who gave the direction for that Japanese stroke on the Russian fleet at Port Arthur, or the man who might have given the order for the advance of the Boer forces into Natal before we were in any way prepared, would require to possess, must be of a very high order indeed. It would require the very greatest amount of courage; it would require courage of a higher and better order than the troops, whether they be naval or military, required to put it into force. *(Hear, hear, and applause).*

It is, therefore, not to ourselves as soldiers that this lesson is most applicable, but it seems to me, that it is to the nation at large and to its statesmen that we must look for this higher order of courage which this position must demand. *(Hear, hear, and applause).*

Then of course there is another point which as soldiers we have always got before us, which we cannot keep too much in our minds, which we cannot emphasize too much, and cannot rub in too much on every occasion, and that is "offensive," "offensive" and "offensive," in

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every shape of the term and on every occasion it must be "offensive," *(Hear, hear)*; if there is a defensive line of action it must lead up to the offensive on every occasion and in every direction. We must do our very best to make it an offensive action in some shape or form.

There was one small point in which I am not quite sure that I followed the Lecturer when he spoke of what might have happened had the Boers had the courage to drive their forces Southwards into Natal and capture Durban. The result would probably have been an insurrection throughout the Cape Colony, and we should have found ourselves in desperate straits, but I understood the Lecturer to say that he read into history that had that taken place South Africa would have been wiped out of the map of our Colonies. I should be sorry to think that that would have been the case in its entirety. Unquestionably we should have been in a bad way, but I think we should have been able to face it, and that we should have been able to right that position at great loss to ourselves.

THE LECTURER: I did say that; it is only an expression of opinion, Sir, but I must honestly confess that I think, had the Boers got possession of Durban, there would have been a great insurrection throughout Cape Colony, and we should probably have had nearly 200,000 men in arms against us, we should have lost Cape Town, Port Elizabeth and East London, so that we should have had no landing place (that is my idea) and we should have lost South Africa.

GENERAL BELFIELD: Quite possibly, but I think we should have got it back again.

There is one small point again which I should like to touch upon, and that is that the Lecturer classed our politicians amongst those who were opposed to the reform he looked forward to. I am not going to express an opinion one way or the other as to the value of that reform, but the Lecturer has classed politicians amongst those who are opposed to the reform he looks forward to in connection with our national forces, and opposed to national training. I venture to differ from him, because in my humble opinion a politician has not got any individual opinion about it at all. He will make his politics suit the wish of the nation as a rule, and when he finds that the nation is in favour of this universal service, so will the politician be. You see our statesmen do not govern the country. It is the people as a whole who lead the statesmen. They are driven by the force of public opinion in the direction which the people of the country, or rather the majority of them may dictate. Thus every unit in the country has weight, and work for the advantage of the whole may bear fruit. That is all I have to say. *(Loud and continued applause).*

LIEUTENANT CHAMBERLAIN, R.N., (retired): Colonel Cowan, Ladies and Gentlemen, I think this country suffers from the defects of its virtues. It is a well known fact that we are a nation of sportsmen. The term "sportsmen" immediately implies fairness of conduct in the initial stages of any contest called a game. We are rather inclined to treat war as if war was a fair game. War, as the Lecturer has pointed out, is one of those games in which unfairness is an essential qualification for the nation which wishes success, and we, being sportsmen by nature, are always rather inclined not to take

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unfair advantage while the other nations, who are not sportsmen, study war from the point of view which the Lecturer has pointed out.

As regards firing first, it might interest the audience to know the true story which I heard as I stood at Fontenoy, at the very spot where this officer took off his hat. This officer of the Guards had had a light breakfast and had drunk a little spirits, he was elated and, contrary to all the spirit of discipline, this young man stepped out, took his hat off at a distance of thirty paces from the French Guard and said in French to our troops "Gentlemen of the Guards, we never fire first," but the French did fire first nevertheless. Now it may be asked "Why did this French officer say to the English Guards "we never fire first"? Was it chivalry? It was drill. If you go to Paris and get permission from the Minister to look at the Instructions issued to the troops in the previous reign (that is the reign of Louis XIV.) because the incident which has been mentioned took place in the reign of Louis XV., you will find it specifically laid down, that the troops are never, if possible, to fire first, because of the advantage in delaying the fire! Therefore, there was no chivalry about it; it was simply a matter of drill.

I would ask you (addressing the Lecturer) kindly to communicate with the Secretary of the National Service League, and I hope they may be fortunate enough to secure you as a speaker in favour of the principles governing national service *(applause)*. You do not treat the subject in the ordinary way; you do not treat it by taking up a leaflet, reading out the principles and expecting all the people to understand them; you argue it out from a matter of fact and from a military point of view, and you point out the great thing—that the burden of the defence of this country should be on the shoulders of every man who calls himself a man. *(Applause)*.

CHAIRMAN: Ladies and Gentlemen, taking the lesson we have learned from Major Ross's lecture, I think that the question we should put to ourselves is, are we as a nation ready now to take the initiative should we happen to quarrel with a first class power? If the answer to that question is in the negative, then I think we should look about us to see how we can forward the case of preparation, how we can impress it upon our statesmen, and if all we soldiers and sailors, as Major Ross suggests, preach it in season and out of season, I think some little weight will be brought to bear.

I would ask you to give a most hearty vote of thanks to Major Ross for his admirable lecture, and if any of you have not read his last book you will find the subject of this lecture very much more fully elaborated there than he has had time to do to-night *(applause)*. Perhaps the best way of supporting him as a beginning is that we should all join the National Service League; they are pressing for some sort of preparation, and our subscriptions will help them to get the services of Major Ross to preach the principles we all approve to the country. *(Loud and continued applause)*.

MAJOR ROSS: I thank you very much, Sir, for what you have said.

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Experiments in the teaching of equitation at the Riding Establishment.

By MAJOR J. F. N. BIRCH, R.H.A.

EXPERIMENTS have recently been carried out in the Riding Establishment with a view to ascertaining the quickest way of teaching a man to ride, an all-important matter in these days, when scientific gunnery claims so much of the artilleryman's time.

Though differing considerably as to the best method of instruction, experts are agreed that the first three things to go for in teaching a man to ride, are:—

1. Balance.
2. Knee and thigh grip.
3. Getting the pupil split up and well down in his saddle.

Hayes and Dwyer, two authorities whom no man can ignore, both advocate commencing with stirrups. Hayes says, "In order to give the grown-up beginner confidence I would strongly advocate that . . . . he should have a broad-seated saddle covered with buckskin and that he should be allowed to ride at first with stirrups." Dwyer, of the Austrian Imperial Service, who turned out many fine horsemen writes,—"The advocates of beginning without stirrups say, you must first give the pupil a seat, and then, when he has acquired balance and a hold on his horse, you can give him the additional assistance of stirrups. Now the most difficult thing to attain is balance, and the stirrup was devised for the purpose of assisting in acquiring and maintaining it; and it is, therefore, just as reasonable to act in this manner as it would be to set a boy to learn swimming without corks and bladders, and when he learnt to support himself to give him artificial aids. But there is another objection, namely,—that the pupil first acquires one seat and afterwards is expected to change it to another and better one." Both these writers advocate quitting stirrups as soon as the pupil has acquired a little confidence, and for as long as possible with due regard to fatigue, and both are strong on the subject of riding without reins.

Other authorities, such as Baucher and Fillis, would commence without stirrups. It is interesting to note that Hayes and Dwyer prefer the present military seat, as being the best one for long distances and cross-country riding; whilst Fillis and Baucher, past-masters in Haute Ecole, favour a straight-legged seat, as being more suited to their performances in the school. Fillis says he shortened his stirrups for outside riding. The French and Austrians commence instruction without reins, but the former is the only European nation

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excepting our own which deprives the pupil of his stirrups until he has a firm seat.

The writer's experience goes to prove that if a man who has never ridden before is allowed in the beginning to ride with a comparatively straight leg, great difficulty is found in making him shorten his stirrups afterwards, constant supervision being necessary for some months. Straight-legged riders are still to be seen amongst the older men in the service.

It is not within the scope of this article to discuss the subject of seats, or the connection between numnah riding and the old military seat. Sir Frances Head, in his book, "The Horse and the Rider," —should the reader care to turn to it—draws interesting comparisons between the straight-legged seat, as used in the plains of South America, and the hunting seat. The experiments carried out recently at the Riding Establishment were confined to getting the man quickly settled in to the present military seat; buckskin saddles were not available or they would have been used. A class of ten trumpeters[1] was formed from the Horse and Field Artillery Dépôts; half of them mounted on saddles with the stirrups loosely tied underneath the horse's belly, and half on numnahs with leaping pads, the whole being instructed together up to the time it became necessary to separate them, by Serjeant Major (W.O.) J. Lynch, who had no bias in favour of either system. It will save confusion in reporting on the results obtained if the boys under the two different methods are treated separately:—

Numnah boys:—

1. The leaping pad was found to be a mixed blessing, the pupil worked forward on it, and was liable to become galled; if the animal suddenly slackened his speed or turned sharply, the rider was apt to roll off, his fall being accelerated by the fact that he was holding on in front. The handles are lower and nearer the rider than the pommel of a saddle, and do not, when held, prevent the body being carried forward (plates A. and B.). Holding on at all is to be deprecated, but doing so at the back of the seat is certainly better in every way, as by this procedure the forward movement of the body is checked. Let the reader sit loosely on a horse and try it. This fact is not only laid down by Captain Hayes, but "Cavalry Training," 1907, states that the arms are not to be folded behind the body because by so doing it is brought forward. It is a pity, therefore, that the leaping pad cannot be fixed on behind the rider. The boys, who were encouraged at the commenement to rely on the leaping pad when in trouble, acquired such a habit of holding on by it that difficulty was experienced in breaking them of this when at a more advanced stage.

2. It was found when jumping commenced, that in order to hold on tighter with the hands the leg grip was slackened, this resulted in falls.

3. The boys quickly tired and had to be dismounted to rest their legs, having no stirrups as a relief.

[1] One saddle boy and one numnah boy were afterwards found to have done a little riding before joining the service, but no jumping.

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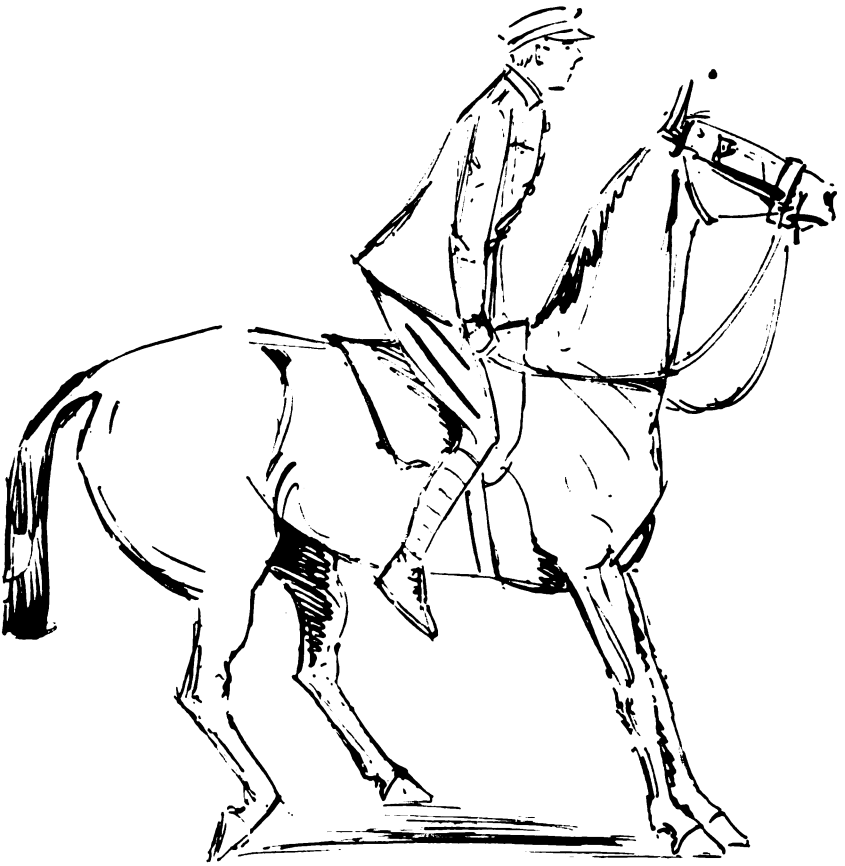

PLATE A. Holding on by the Leaping Pad.

4. Though the leg was placed as in fig. 1, it soon got into the position shown in fig. 2, a certain amount of effort being necessary to keep the leg from straightening; it eventually relapsed into the position shown in fig. 3. It will be seen in reference to fig. 2, that as the leg straightens, the inside of the knee and thigh become round, and not flat as would be the case with the knee bent, thus making grip more difficult. In fig. 3, muscles that are quite useless to the good horseman are being brought into play.

5. If the horse suddenly increased his pace, as the quietest will do sometimes, the boy was apt to catch hold of the handles and so lose all control over his mount.

The instructor, however, was free from anxiety on the subject of getting his pupils down on their seats, and it is wrong to suppose that, because a man commences to ride on a numnah, he necessarily settles into a straight-legged seat, a good instructor will see that he does not. The latter is, however, faced at the commencement with the task of developing two sets of muscles—the flexor muscles at the groin, (to keep the knee up), and the abductor or grip muscles, with-

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PLATE B.

FIG. 1.

FIG. 2.

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FIG. 3.

out the means of resting either when the pupil is mounted. This naturally takes time. At the fortieth lesson all those who started on numnahs were still confined to the school or to a ring in the open, and had, of course, not learnt the aids; nor could they at a yet later date comply with page 51, para. 7, "Cavalry Training," 1907; viz. "ride at a trot, canter, and gallop, and over small jumps without reins."

Boys mounted on saddles with stirrups tied loosely underneath the horse's belly:—

The French have a saddle not unlike an Australian buck-jumping one, into which they force the man without any reference to his comfort or to his make. The object of this is to get the leg into the correct position. In a minor degree tying the stirrups together (fig. 4) has a similar effect, as it helps to keep the lower part of the leg in the desired position. The following additional advantages were gained from the above contrivance:—

1. The boys did not lose their stirrups. (Fillis says that if you give a man his stirrups before his legs have got well down he will not be able to retain them. He evidently fitted them too long at first).

2. They quickly found their stirrups when ordered to retake them.

3. No falls occurred in jumping, and the foot could not shoot forward on landing over the fence. The straps prevented the pupil from leaving the saddle, and eliminated all chances of his losing his balance and falling off backwards when he caught hold of the cantle. Jumping without stirrups was not attempted until the pupil was, comparatively speaking, at home in the saddle with stirrups and without reins. As there were no falls no case of dragging occurred. A man's foot was on one occasion made fast in a stirrup and he was dragged for experimental purposes, and it did not appear that the strap joining the stirrups increased the danger. It is, indeed, worth noting that with the stirrups tied together it is impossible to get dragged if hung up in the stirrup on the opposite side to which the fall occurs—otherwise a common cause of accidents. Care must, however, be taken to see that the strap (fig. 5) is properly fitted; if too tight the man's knee is brought away from the saddle, if too loose there is a danger of the horse getting his hind legs through it when

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jumping. The strap should not be used after the initial stages of jumping. If the fence is big the animal is more liable to fall, and the pupil then shares the fate of the accomplished horseman and gets mixed up with his horse on the ground.

The instructor rode alongside the boys and taught them first to rise in the saddle from the knee at a walk, and then at a trot, with the object of developing the muscles of the knee and thigh grip, on the principle that the quicker the boy got his grip the quicker he would learn balance—the power of grip giving confidence.

The greatest care was taken in fitting the stirrups to the pupil's comfort; at first, in rising with stirrups and in the initial stages of jumping, the boys were instructed to catch hold of the cantle of the saddle with one hand, but never the pommel. This was found to answer well, as not only was the balance of the body more or less preserved, but holding on at the back never became a habit, being rather more of an undertaking than catching hold in front, and the boys soon learned to rely on their legs and not their arms.

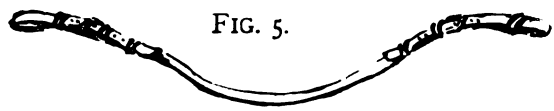

FIG. 5.

FIG. 4. When used for a long legged recruit the strap can be put through a loose runner fixed to the centre of the girth.

Balance comes by practice and is more quickly acquired by men with pluck and nerve than by those who lack self-confidence; once learnt it is quite instinctive. The pupil was taught balance as follows:—

At the third lesson reins were dropped as much as possible, and later the pupil rode without reins or stirrups. If stirrups alone had been done away with the pupil would have kept his balance at the expense of the horse's mouth, which in the case of a hard one, would have prevented the balance from being true. Hayes rightly says that holding on by the reins is a most difficult vice to eradicate if once learnt. When the pupil understood how to adjust his centre of gravity mechanically to the horse's movements he was given his reins, and turns and circles were constantly practised first with, and then without stirrups.

As a substitute for the French "piliers," the boys were early given continual practice in jumping over very low obstacles, (which would have been impossible without the strap), for the first few times with reins held in the ordinary manner, and then with reins let out to the full extent, and later without reins. Single jumps about two foot high were placed at each side of the school, and the class went

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round and round over them for half an hour with the necessary intervals of rest. This is the secret of getting the pupil quickly settled into his saddle, is the best lesson in balance, and is not so wearing to the horse as might be supposed. Grip is useless when jumping unless the body is more or less balanced. The recruit is apt to lean back when riding at a fence without reins, this should not be allowed as it causes him to lose his balance when the horse rises.

A careful diary was kept of what was undertaken each day, which showed accurately the progress made by each pupil. The advantages of the system were found to be as follows:—

1. All three essentials, viz. grip, balance, and getting down into the saddle, were taught with the least discomfort to the pupil.

2. Riding without stirrups could be given in gradually increased doses each day without over fatigue from leg weariness and too much bumping; it is useless to exercise a tired muscle.

3. It was possible always to keep the leg in the correct position; a most important thing.

4. At the 5th lesson the boys could be given some idea of the use of the leg and hand, (when at the walk), without ruining their horses' mouths, which they certainly would have done if this had been tried without stirrups.

At this stage it was apparent that these boys were creeping away from the ones on numnahs, who quickly became fatigued; and at the tenth lesson, when the superiority of the method as regards time only was thoroughly established, the saddle boys were put through the following exercises on dummy horses for about ten minutes each afternoon, with a view to proving their value; the riding lesson taking place in the morning. Exercise No. 3, is in "Cavalry Training," 1907, and No. 5 is a modification of an exercise recommended by Baucher:—

1. Rising from the knee with stirrups.
2. Rising from the knee without stirrups, (at a later stage).
3. Touching the foot with the hand on each side, with and without stirrups.
4. Leaning forwards and backwards in the saddle, with and without stirrups.
5. Swinging the lower part of the leg to the rear, and towards the horse's side, so that it describes a circular motion.

In all these exercises the knee should be kept firm on the saddle, and no assistance derived from the lower part of the leg.

6. Relaxing and tightening the knee and thigh grip.

Supervision is simpler if a dummy horse is used, and the instructor is on the same level as the pupil; the latter is also not preoccupied with the thoughts of managing his horse and learns to be entirely independent of the reins as far as his seat is concerned. A trial will convince anybody how quickly these exercises strengthen the knee and thigh grip, but an equal advantage derived from the first five, is that the recruit learns from the commencement that the knee should be immovable in riding and that the lower part of the leg must be

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used as an aid.[1] It was remarkable with what ease and correctness the boys on saddles used the lower part of the leg after a few lessons on the dummy horse. If these exercises had been started a fortnight before the instruction commenced and continued during its course, even more striking results could have been obtained. A tribute to their usefulness is found in the fact that men who come to the Establishment for the rough-rider's course are continually practising them in their spare time. Exercises 3 and 4 were practised during the riding lesson at a trot and canter towards the end of the course as balance exercises.

At the 25th lesson the saddle boys were fit to leave the school; at the 40th, they were well down in their saddles and could:—

1. Jump a bushed fence 3 ft. 9 in. high and 3 ft. 4 in. broad, and in-and-out jump 3 ft. 9 in. high and 6 yards apart, without reins or stirrups.
2. Do a figure-of-eight correctly in the open at a trot and canter without stirrups.
3. Ride up and down a steep incline at any pace.
4. Gallop a horse in the open and pull up quickly.

Having firm seats, these boys could then be taught the real meaning of the word "hands" and of the other aids. The only danger of commencing with stirrups is that a bad instructor might get a small percentage of his men perched on the back of their saddles.

Records at the dépôt prove that boys require more lessons than grown men to qualify for dismissal, but it should be noted that these boys had thirty lessons on the dummy horse in addition to their riding lessons, which undoubtedly made their progress more rapid. It should further be remarked that their horses were well trained, their saddles unpolished, and their instructor exceptionally good.

The following authorities were consulted before the experiments were undertaken:— Berenger, Newcastle, Baucher, Adams, Fillis, Head, Mayhew, Gibbon, Lord Pembroke (1761), Hayes, Dwyer, Martinengo Cesaresco; Text-Books past and present (English and foreign), Official Reports, and "La Connoissance parfaite des Chevaux," (1741) author not stated.

The writer has been much struck in his readings by the dictatorial tone of most of the authors, who nearly all assert that their way and no other must be followed if a real horseman is to be made. He cannot help wishing that they had all seen the best of a fourteen-mile point in Leicestershire and ridden a tired horse thirty miles home; won the Kadir Cup; played in the Inter-Regimental polo tournament at Hurlingham, and then taught riding for some years before writing a book. Under these ideal conditions some of their conclusions would have carried more weight. It is impossible to get the impression out of the back of the mind that the majority thought more of the "Spanish Trot" than of travelling long distances over a rough country, and show in their writings an undue preference for a straighter legged seat than is now the order of the day.

The writer does not claim to be an authority, and is in no way prejudiced against numnah riding; if time is not vital it is an ex-

[1] The small fat-thighed man must hold on a little with the flat of the lower part of the leg.

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cellent thing, especially for the fat-thighed man, but owing to his roughness the draught horse is seldom suitable for the purpose. On the other hand it is making a sweeping assertion to say that a man cannot be properly taught to ride unless he commences on a numnah. If this were true, few men in the British army could ride, whilst in reality the contrary is the case; riding has improved out of all knowledge where time and trouble has been devoted to it, since the days when men commenced to ride on numnahs.

The Englishman has, as a rule, the best leg in Europe for the saddle, and should settle more easily into it than the foreigner. There are many fine horsemen in England at this moment who not only have never been on a numnah, but have never ridden without stirrups in their lives.

Experience has taught the writer that as much practice as possible should be given to the pupil without over-fatiguing or chafing him. A man will learn to ride in a third the number of lessons if he begins with one a day and goes on to two, instead of riding only twice a week.

On page 45 "Cavalry Training" the following passage occurs:—

"The methods advocated in this book are intended as guides to "instructors, and are not to be blindly followed to the destruction "of initiative and progressive methods of their own."

The main principle, viz. concentrating an instructor's efforts primarily on getting a man a firm seat and correct balance, has been strictly followed in these experiments. The horse plays a more important rôle in the cavalry than in the artillery, and more time can be given to equitation in the former service. A squadron can turn out at any strength, a battery must have every man mounted on parade or its gunnery goes to the wall. "Cavalry Training" lays down six months' training in equitation before a "good" recruit is fit for the ranks.

In conclusion it is as well to repeat that these experiments were carried out to ascertain the quickest way of getting a man fit for the ranks,—a matter of vital importance in the artillery.

If time is no object, and easy riding horses are available, it is a matter of small importance whether a man commences on a saddle or on a numnah.

A dummy horse for teaching balance is now on trial at the Riding Establishment, and if satisfactory, must prove of great value to the recruit and to the instructor. It is a fact that as the horse leans inwards when circling, the beginner has a natural inclination to lean outwards under the mistaken impression that he will save himself a fall, whereas the accomplished horseman's body follows the movements of the horse. This tendency of the recruit explains why he so very generally falls off at the corners.

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Communication in the Division.

By CAPTAIN J. E. F. d'APICE, R.A., B.Sc.

IF the division is to be an independent body self-contained and self-supporting (even for a time) we must not only ensure that it is complete in itself, and that each of its component parts is also complete in every detail, but we must ensure also that such component parts are properly connected together under one central head or nerve centre, who will direct the movements of the whole and will immediately become aware of anything affecting any of the lesser or outlying parts. And each of these in turn must have its own constituents similarly connected. As in the body the nerves do this, and connect each part to the brain, which in turn directs the movements of all parts through the nerves, so in the military unit, be it division, brigade or battalion, we must have a perfect system of communications between the commander and each portion of his command. Otherwise our organism is no longer compact and complete, but we have the lesser units acting incoherently and independently both of each other and of the directing head. This state of affairs can only lead to confusion, poor results and a waste of energy, however perfect each lesser unit may be in itself.

As modern weapons have been greatly improved, their ranges increased, and the lines of operations extended, so information has become harder to obtain and more complicated methods have, therefore, to be made for its transmission, as well as for the transmission of orders to the outlying portions of the force.

Moreover, these extended operations required by modern strategy and tactics can only be possible provided we have a thoroughly reliable system of communicating with all parts of our dispersed force.

In the recent Manchurian War, both Russia and Japan greatly felt the want of a proper system of communications. It was not till quite late in the war that the Russians organised a very imperfect system of signalling, somewhat akin to our semaphore system, and also made use of the telephone, while the Japanese used the telephone, but had no proper system of signalling.

As a result, communication was rendered extremely difficult, and in cases impossible, and where co-operation would have given successful results, the reverse was the case, or no operations could be attempted through want of means of communication, even though the country was peculiarly adapted for signalling communication. On one occasion outside Mukden the wires of the whole Japanese telephone system were down in a sandstorm, no other methods of communication were available and Army Head Quarters were completely

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cut off, and did not know for twenty-four hours where the different divisions had got to.

Thus we see the paramount importance of a well organised and complete system of communication throughout an army and so throughout the division.

For the purposes of this paper we will only consider the internal communications in a division, ignoring for the moment its connection with Army Head Quarters and with other divisions.

This communication may be divided into three broad heads:—

1. Transmission of information from outlying parts of the force (i.e. from brigades, divisional cavalry, patrols, scouts, &c.,) to the G.O.C. at Divisional Head Quarters.

2. Transmission of the G.O.C's orders based on information thus received to the different parts of his command.

3. Inter-communication between the different units of the division and the internal communication in each of these units.

It is obvious, therefore, that the necessary and successful action taken depends not only on accurate information, but also on the rapid and accurate transmission of this information as well as of the orders based upon it.

The importance of a proper system of communication is here again emphasized.

Let us now examine the means of communication we can employ with the advantages and disadvantages of each, and then we can consider how best to organise these means into a proper system to give the best results. These means of communication may be said to be:—

1. Manual; 2. Visual; 3. Electrical.

Manual methods are:—

Foot orderlies; mounted orderlies; cyclists; motor cars; motor cycles.

They would generally be used to carry to and from terminals of other systems, also for short distances when they are good. They must be used for carrying sealed despatches, maps, photographs, &c., and would have to be resorted to should other methods break down.

Their disadvantages are that bearers may be killed or lose their way, and are dependent to a great extent on state of roads and nature of the country.

To the above manual methods might be added carrier pigeons and dogs. Carrier pigeons might be useful in a siege or for fortress warfare, but not for field operations. The messages have to be sent to a fixed station to which the pigeons have been trained to home. Dogs may be useful in that they are small and escape notice and are clever as messengers, but they will not go where bullets are flying and are, therefore, unreliable. Pigeons are extensively used in the Italian Army.

Visual methods are:—

Flag signalling by code flags; flag signalling by semaphore; flag signalling by morse; lamp signalling; helio signalling; signals attached to balloons or kites; rockets; fires.

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Code signals are useful for communicating between shore stations or forts and ships or transports, but necessitate cumbersome equipment and a complicated code (which may easily be lost) being carried, and are, therefore, not suitable for field work.

Similarly, signals attached to balloons or kites have the same disadvantages, but have the advantage that they are seen simultaneously by most of the troops within a considerable radius, and are, therefore, useful for making a signal for a simultaneous attack, halt or withdrawal, though they may also be visible to the enemy.

Semaphore is easily learnt and is an excellent quick method for short distances up to about 1,000 yards.

Flag signalling by morse code is a good and rapid as well as accurate method up to about three to four miles on the small flag, and five to seven miles on the large flag. It has the disadvantage that the messages are liable to be intercepted by the enemy, and also that it requires a certain amount of manual labour on the part of the sender, particularly if sending by the large flag which he might not be able to keep up for long periods of time.

Ordinary Begbie or oil lamps, as at present in use in the service, at night have a range of about seven miles, but this depends on the state of the atmosphere and on the climate. Even a greater range might be got in a clear atmosphere free from mist or fog.

The small lime light with an oxygen jet through a flame on to a lime pencil has a range of from ten to fifteen miles, or even further. While the large lime light, even in daylight, has been read up to twenty-two miles.

The latter two are cumbersome and require gas to be generated for them on the spot, or to be carried for them, while all three have the disadvantage that their light has a wide cone of dispersion, and thus messages can easily be intercepted by the enemy. Also their light attracts the enemy's attention, and indicates to him not only the position of your signal station, but also that of the force you are working with.

On a still night too, even though the light may not be seen, the station can be located from a considerable distance. In South Africa I have known patrols to find their way when lost, by the noise of the shutter, and although this might be an advantage, yet it is hardly balanced by the similar information given to the enemy.

All have the disadvantage that their light will not penetrate fog or heavy mist.

Helios are excellent when the light is good. They are rapid and easily used, and their range is practically only limited by the nature of the country and the state of the atmosphere. They have in exceptional cases been read up to sixty and seventy miles, but constant communication at this distance would be impossible. Messages sent by them are not easily intercepted, as the cone of dispersion of their light is only 1 in 107. They have the disadvantage that their use is dependent on sunshine.

Flags, lamps, and helios are the most useful of the visual methods, and every signal station should be equipped with all three, but such stations invite the enemy's attention to the places where they are

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seen and are difficult to establish within his fire zone.

Rockets and fires have the same use as balloon or kite signals, but can only convey pre-arranged signals, moreover, rockets may be missed unless a careful lookout is kept for them.

Electrical methods are:—

Telegraph along wires, air line or cable; telephone along wires, air line or cable; wireless telegraphy; wireless telephony, in future, perhaps.

Electrical methods are most useful owing to the rapidity and accuracy with which they transmit messages, and also they give no indication to the enemy where a station may be, unless he happens to come across a wire.

Telegraph along wires forms the main portion of the system. It is rapid and accurate, but requires a highly trained staff and it takes a considerable time to lay the connecting wire or move a station once fixed. Wires are liable to be broken or cut by the enemy. Cumbersome equipment has to be carried to give necessary electrical power. Would be of use to connect Head Quarters of Brigades to Divisional Head Quarters and thence to Army Head Quarters, and so on to the base, but it could not well be advanced further than Brigade Head Quarters.

The telephone is a most useful instrument. It can be attached to any wire connecting to the desired station and the C.-in-C. can talk to any of his subordinate generals himself. Light lines of wire can be carried quickly forward from the terminal telegraph stations, but in my opinion these should not be carried as far as the fighting line. It is of the greatest use in observing or directing artillery fire.

The Japanese found they answered admirably in the late war when ample time was available for preparation, and that they were particularly useful for artillery fire control.

In the American Army they use the "buzzer" or "vibrator transmitter" to a very great extent, using a light compact instrument and light wire which they do not bother about taking up again, but simply cut and leave. They use this buzzer whenever they can.

Owing to its heavy and cumbersome form the field telephone as supplied in our service could not be used to this same extent, nor could our buzzer which is even more unwieldy with its large battery.

What we require is a small compact instrument such as the "Medhurst" telephone which is in use in the Australian Army. This in its case complete does not take up more room and is not much heavier than a pair of field glasses. It combines both telephone and buzzer, and has been used with conspicuous success on manœuvres. It can be connected to any wire, but reels of thin light wire can be carried with it.

Telephones require trained operators and are liable to get out of order if entrusted to unskilled men, and in this case messages are liable to be wrongly transmitted. The light wires are liable to be broken, and the Japanese found the wires got in the way of horses and men.

In Manchuria the excessive cold broke the wires, and the batteries of both telegraphs and telephones gave out in severe frosts.

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Wireless telegraphy is still practically in its infancy and experimental stages as far as our army is concerned, and till it has been sufficiently tried there is not much to be said about it.

In the latest "War Establishments" two wireless telegraph companies have been allowed for the army to connect Army Head Quarters to the independent cavalry division, and if it successfully solves this difficult problem it will be a step in the right direction. Messages are liable to be intercepted by the wireless stations of the enemy.

Each of the above methods of communication may be of use under certain conditions, and as occasions arise we should endeavour to employ that method at our disposal which will give the quickest results combined with accuracy. To quote Lieut.-Col. Watson, I.A., " No one of these is to be solely relied upon. Each is dependent on " the other . . . . From the head quarters to the firing line the " instruments employed will include wireless telegraphy, light field " telegraph and telephone, visual signalling and orderlies."

It is obvious that it will not be possible to supply all parts of our force with all the above methods. Nor would it be desirable to do so. What methods are supplied to different bodies would depend not only on their size and mobility or otherwise, and their distances from head quarters, but also on the nature of the country they are operating in.

Let us now consider how best to combine these methods into an organised system.

In the British army at present we have no combined system.

Orderlies are provided haphazard from any troops which may happen to be handy without any reference to their fitness for the duty. Regiments are deprived of the services of these men when they need them most.

Signallers for brigade and divisional services are collected like orderlies from different units. They have frequently never worked together previously, and do not know each others methods, while the divisional or brigade officer has never seen many of them before and can have no knowledge of the capabilities of each as he should have. And again, the regiments who have to supply them are deprived perhaps of their best signallers just as they are going into action and need them most.

Telephones are worked sometimes by the R.E., and sometimes by men of purely combatant units.

Telegraphs are worked as a combined unit by the R.E., but independently of the signallers and of other methods.

We have seen that no one method is sufficient in itself, and that as occasions arise one method may have to be replaced or duplicated by another. How then can we get efficiency in our transmission service unless all methods are placed under a common controlling head? To ensure thorough co-operation and also economical use of our various materials so that all parts of our force are well and quickly served without waste, it seems to me to be absolutely essential that the whole of the transmission services should be formed into one Corps, and that all the members of this Corps must be specially

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trained for their important duties.

This is not such a drastic change as may appear at first sight. We have a splendid nucleus to work on in the R.E. telegraph companies and in the regimental signallers, many of whom could be transferred to this Corps, and their places taken in their units by newly trained men now in peace time.

We also have our signalling school with its various branch schools which would become the training centre of this new Corps.

Nor would the establishment of our army be so greatly increased. We will probably find that we shall require fewer men for the transmission service if properly trained and organised than at present have to be taken out of the fighting line. So then the only increase in establishment will be to complete our fighting line units up to their proper strength, which after all is only right.

Unfortunately economy has always to be very carefully considered in introducing any improvement in our army or it will not be entertained. But I do not think this change would involve any very great extra expenditure if formed on the lines I have indicated. Of course extra pay would have to be given to the men of this Corps as they must be specialists, but this extra expense is well compensated for by the great increase in efficiency I maintain we would have, and we would save, or rather merely transfer, the expenses of our present telegraph companies to another branch of the service.

Nor is this idea of a Communication Corps a new one.

In the American Army they have a signalling Corps which is one of the Staff Departments and consists of about forty to fifty officers and 1,200 N.C.O's and men under a permanent chief, who is a General Officer on the Headquarter Staff, and can devote his time entirely to problems of communication.

In each division there is a battalion of the Signal Corps of fifteen officers and 333 men organised in two mounted companies of fifty-five men each, and two dismounted of 110 men each (of whom twenty-five are mounted).

Each company has one Captain and three Lieutenants and is divided into sections and squads, which are further divided into groups. The whole of the communication up to the advanced detachments is entrusted to the Signal Corps who carry complete equipment for visual as well as telephone or buzzer communication.

This system has the supreme advantage of cohesion, but they have no regimental signallers with units, which I think is a mistake.

The total equipment carried by a battalion of the Signal Corps is:—

400 miles of buzzer line, weighing 20 lbs. per mile; 340 miles of field cable, weighing 120 lbs. per mile; 80 buzzers and telephones; 40 field telegraph instruments; 56 sets of signalling kit, each set comprising, heliostat and shutter, lamp, flags, telescope.

For transport of this they require:—

128 pack mules; 160 horses; 104 draught mules.

In Australia they intend forming a Communication Corps, which is rendered particularly advisable there owing to their army consisting mainly of volunteers, or partially paid troops, whose signallers

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would not get the same opportunities for training as regulars.

In India they have practically the same regimental signallers as at home, but all divisional service outside purely regimental work is supplied by signalling units. These units consist of six men each obtained from non-mobilised regiments. Sets of equipment are kept ready for these units at certain central arsenals and are issued on mobilisation. This system is an improvement on ours, as the fighting units are not depleted, but it has the same disadvantage that the men forming the signalling units are unknown to each other and to their officers. And in a campaign, as happened in the Tirah Campaign, units which originally are not mobilised and supplv the signalling units may have to take the field and will then have to do so without their complement of signallers. Again, the telegraphs are under separate control—the civil department, which is a disadvantage.

An experimental Transmission Company was tried in the 2nd Division comprising of signallers and orderlies of the Division. During manœuvres, the telegraphs and telephones within the division were also included, and the result showed a great improvement in the efficiency of the transmission service. Moreover, in the opinion of the officer who trained and commanded this company, still greater efficiency would have been obtained had all the men, including the telegraphists, been under one head and had previous training together. Difficulty was also experienced owing to the men not being under the officer training them for discipline. This again points to the necessity for the formation of a Communication Corps.

I should not advocate the present regimental signallers being entirely abolished and their places taken by members of this Corps as in the American army. It might lead to friction, and in my opinion to inefficiency if we sent small details of the Communication Corps to work with regiments or batteries.

From the above, then, the organisation best suited to give the greatest efficiency in the communication services of a division seems to be:—

To have a Communication Corps controlling the whole of the methods of communication and supplying all services necessary between Divisional Headquarters and those of brigades and divisional cavalry, artillery and engineers, as well as all services at these various Headquarters.

The battalions, cavalry squadrons, brigades and batteries of artillery, and engineers, would have their own regimental signallers as at present for internal communication and to connect them to other various Headquarters, and to each other where necessary.

The organisation best suited for this Communication Corps in the division would be in companies, each consisting of a certain number of sections and units, a unit being composed of a squad of men fully equipped to form a signal station where necessary.

We have considered the kind of communication we have to supply, the methods and material at our disposal, and how best to organise them.

Let us now determine the allotment of these materials and the personnel necessary for them.

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Divisional Headquarters would best be connected to each of its three infantry brigades by field telegraph, and also by this method where necessary to Headquarters of Divisional Artillery. This would necessitate four field telegraph sections, each of one officer and eight mounted and twelve dismounted men. Each section would have a light cable cart and material for laying down and working a light line of cable ten to fifteen miles long. It would also be equipped with two helios, two lamps, two telescopes, two buzzer telephones, and flags to assist the field telegraph when necessary or replace it when broken or being laid.

Each Communication Corps "unit" or squad would be capable of forming a terminal or transmitting signal station where necessary, and should consist of six men carrying two helios, two lamps, two buzzer telephones, two telescopes, flags and fifteen to twenty miles light buzzer wire. Mounted squads would have a pack mule, and dismounted squads would also have this and might be provided with cycles capable of laying buzzer wire.

With each Infantry Brigade Headquarters would be one officer and three squads, two to connect it to the four battalions and one for lateral communication, or in reserve. In addition to these, there would be two mounted and three cyclist orderlies who would also perform dismounted duties. And at Divisional Artillery Headquarters we should require the same numbers to connect to each of the three artillery brigades, the field howitzer brigade and the heavy battery, and ammunition column. Though as the C.R.A. would probably be near Headquarters and an artillery brigade might be with an infantry brigade the line already formed might suffice. As the cavalry squadrons would probably operate independently of each other they would each require a mounted squad to connect them to Divisional Headquarters, and to each squadron might be added four cyclists.

At Divisional Headquarters would also be required say another two squads and sixteen orderlies for lateral communication, and to connect with divisional ammunition column, engineers, supply and transport park (which might be behind), and supply and transport column.

The field ambulances would be with the infantry brigades, and would be connected by the lines already laid down for these.

The whole of the above would be organised into four companies under the control of an officer on the Headquarter Staff of the Division, who would be directly responsible to the G.O.C., and would have an orderly officer to assist him.

Each company would have:—

	Officers.	Men.	Sets of Equipment.
1 field telegraph section	1	20	2
1 signalling section	1	24 (4 sq'ds)	8
1 orderly section		10	
Total...	2	54	10

Thus the communication corps in a division would consist of

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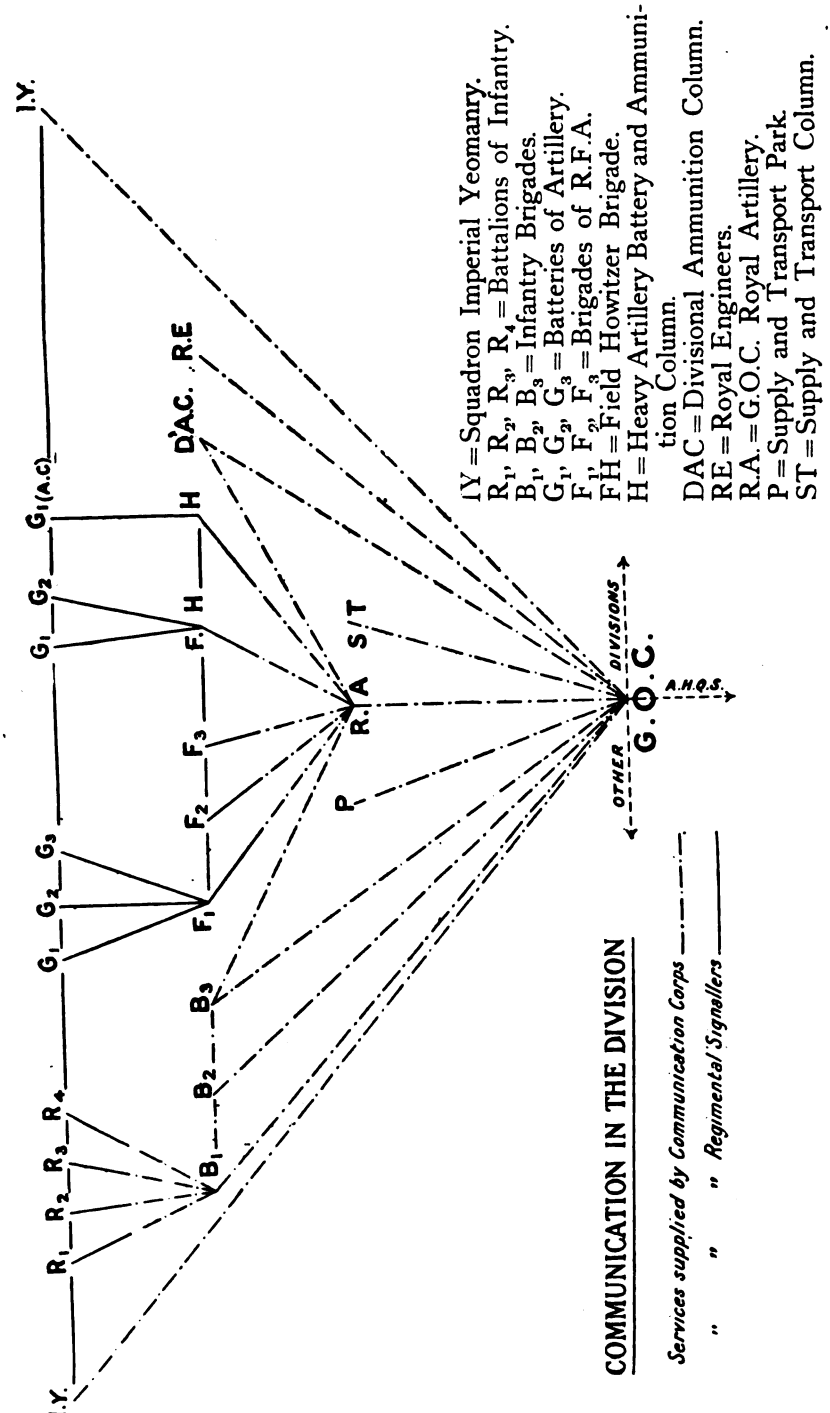

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ten officers and 216 men with forty sets of equipment, and four field cable carts.

Each set of equipment would consist of:—

One helio. One lamp, (an improved pattern burning either carbide or oil, thus avoiding necessity of carrying lime lights for longer ranges, and also useful in dull daylight when no sun). One telescope. One buzzer-telephone, (neither of the present cumbersome patterns, but an improved light instrument combining the two such as the "Medhurst" already explained). Flags, small and large. Buzzer wire, a light wire about 15 lbs. to the mile.

To each division might be added also with advantage a motor car and motor cycles. G.O.C's would have their own motors for personal conferences, &c.

I have purposely avoided touching on the transport and horses necessary for the above as they are beyond the scope of this paper.

Now let us consider the regimental signallers in the division, who would not be included in the Communication Corps.

Each battalion of infantry should have a regimental signalling officer and eighteen signallers provided with six sets of equipment to connect with the Communication Corps signallers at Brigade Headquarters, and for internal communications, but these latter would mostly be supplied by the semaphore system.

With each artillery brigade there would be an artillery brigade signalling officer and twelve signallers provided with four sets of equipment to communicate with corps signallers, with C.R.A., and with the batteries. Besides these, the artillery would also require additional telephones for observation and fire control work, but this should be entirely apart from the communication service, and, therefore, we need not consider it here. Batteries would have their own signallers as at present.

But this brings us to another most important point, and that is what is the best method of communication to adopt to ensure co-operation between the supporting artillery and the attacking infantry? This is a difficult as well as a most important problem, and at present the only means of ensuring co-operation is by what the artillery can see from their own position, which is generally very little, as the majority of the attacking infantry are out of sight and, therefore, any distinguishing marks on their clothing as has been suggested would be useless.

In Manchuria the Japanese used the telephone with some success and the Americans use the buzzer, I understand. But the telephone cannot be relied upon alone, wires may break, and situations altering batteries may quickly have to change their positions, so we must have visual signalling to fall back on in addition. Therefore, with each brigade of artillery we should have a squad of artillery signallers for this purpose, who would be equipped with telephones (light buzzer pattern), flags and lamps, helios, I think, would be unnecessary. With them the artillery signalling officer should go forward, as he should understand the correct and useful information to send back.

The engineers would have one set of equipment and three regimental signallers.

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The I.Y. squadrons would have six regimental signallers and two sets of equipment for internal communication, but their external services would be performed by the Communication Corps men. I have departed from my scheme in this instance because the cavalry of the division is to be provided by the I.Y., who have not the same opportunities for training as regulars, and whose signallers cannot, therefore, always reach the high standard required for our Communication service. As a matter of fact these squadrons would generally be used up on escort and extra orderly duties, and when this is the case the Corps signallers allotted to them would form a useful reserve.

Training of personnel:—

The officers of the Communication Corps would be selected from officers of other branches who have shown proficiency in signalling. They should be on probation for six or twelve months, during which they would go through an extended course at the central school of instruction, and would then, if proficient, be appointed for say five years to the Communication Corps, after which they could return to their regiments, or remain permanently in the Corps, much the same as Ordnance Officers do now. Regimental signalling officers would have to qualify as instructors at one of the Corps schools, at which classes would be periodically formed for them, comprising much the same curriculum as at present, but extending over at least three months, similarly for regimental assistant instructors.

The men of the Corps should be long service men, either specially enlisted or transferred from other branches. Each man on joining should undergo a six months course, consisting of all methods of visual signalling, telegraphy and telephony, and map reading. A knowledge of electricity is also essential to enable men to keep line and instruments in proper order and repair breakdowns in either. They should also be trained in orderly work. The best should be picked out and trained as telegraph operators. From the school or schools, they should be drafted into companies of the Communication Corps, where they would be posted to a telegraph signalling or orderly section.

These companies should be completely equipped and form a permanent part of the divisions, and, moreover, the sections allotted to brigades, &c., in war time should be trained with these in peace under their own officers.

And similarly with the higher organisations.

The Corps should be exercised in manœuvres with all arms under active service conditions, breakdowns should be caused in the electrical methods so as to train men to maintain communication under all conditions. Orderlies would be practised in their duties. Regimental signallers should be similarly thoroughly trained in their own units, and besides this, all, or at any rate a proportion of the other men should be taught the semaphore system of signalling.

A step in the right direction was taken when it was decided to include the regimental signallers among the specialists entitled to proficiency pay.

The regimental signallers should be inspected and examined

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annually by an officer of the Communication Corps Staff, and all methods of signalling should be uniform throughout the army.

If I have been unduly long in this discussion, I must plead only the interest of the subject and its importance.

For the sake of brevity I have not given all my reasons for the various proposals and figures, nor have I attempted to go into minute details and give the exact numbers of the proposed Corps, or its transport horses, equipment, &c. All I have hoped to do is to have given a rough idea of the lines on which I think our present independent and, therefore, unreliable methods of communication ought to be combined and organised systematically. Unless this is done, whether on the lines I have indicated or not, the division cannot be said to be complete in itself, and cannot hope to take the field successfully against a well organised enemy.

I am greatly indebted to a valuable paper "Information on the Battlefield," by Colonel J. E. Capper, C.B., R.E., for much of my data and to his courtesy in allowing me to make use of it.

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Ratio of Movement in Auto-sights.

By MAJOR L. E. B. DYKES, R.G.A.

IN this article it is first proposed to obtain a simple formula for ratio of movement in the ordinary depression auto-sight, and then show how, by its aid, the auto-sight problems usually set, and others of at least as much practical importance, can be readily solved.

Ratio of movement, that is the ratio which the movement of the gun, when its position at any elevation is slightly changed, bears to the corresponding movement given to the sight, is the essential principle of auto-sights. It should be made as familiar as possible to everyone dealing with them, and it is for this reason, as well as because less trigonometry, and mathematics generally, seem to be involved, that it is proposed to substitute new solutions for some of those given in text-books.

The following symbols will be used:—

M = ratio of movement of gun to sight.

α = angle of sight, θ = angle of descent, $(\alpha + \theta)$ = angle of arrival.

β = angle of tilt in minutes.

R = range in yards.

h = height of gun over sea in feet. t = movement of tide in feet.

Formula for ratio of movement:—

It is proposed to show that:—

$$M = \frac{\alpha + \theta}{\alpha} \quad \text{.....(i)}$$

for all guns for which α, and θ, are reasonably small; that is to say for all guns at ranges at which auto-sights are used. The proof is simple.

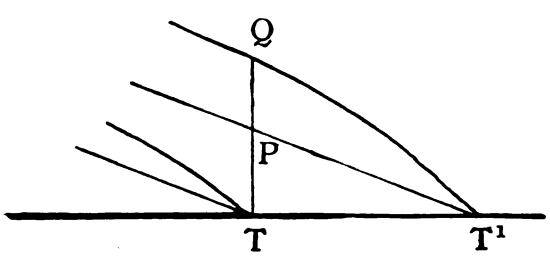

FIG. 1.

Suppose, in fig. 1, that the line of sight and trajectory meet at T on the water.

And suppose the gun to have its elevation slightly altered, bringing the trajectory to T^1.

Then, by the principle of the auto-sight, the gun and sight must be so connected that the latter also has simultaneously been directed on T^1.

Erect T P Q perpendicular to TT^1 and let it cut the new line of sight, PT^1, at P, and the new trajectory, QT^1, at Q.

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In order to get the trajectory from T to T^1 it must have been raised from T to Q, and, assuming the rigidity of the trajectory, the gun must have been moved through what ever angle TQ subtends at the range of the point T.

Similarly the sight must have been moved through whatever angle TP subtends at the same range.

M, the ratio of movement is, therefore, represented by $\frac{TQ}{TP}$.

TT^1 is a small distance and we may assume that the angles of sight and descent are practically the same at T^1 as at T. We may also treat the short curve QT as a straight line.

Thus the angle $PT^1T = \alpha$, and the angle $QT^1T = \alpha + \theta$.

$PT = TT^1 \tan \alpha$.

$QT = TT^1 \tan (\alpha + \theta)$.

$$\therefore M = \frac{TQ}{TP} = \frac{TT^1 \tan (\alpha + \theta)}{TT^1 \tan \alpha} = \frac{\tan (\alpha + \theta)}{\tan \alpha}$$

$\therefore M = \frac{\alpha + \theta}{\alpha}$ if α and θ are reasonably small, as they always will be with auto-sights.

Or the ratio of movement is the ratio of the angle of arrival to the angle of sight.

This very simple formula is accurate enough for all purposes for which it is required. It can be elaborated by including refraction, curvature of the earth, &c., and, when in certain problems a certain rough change of range has been found to occur, new values of α and θ can be obtained, and a more accurate answer thus reached. The gain in accuracy will as a rule, however, not repay the trouble involved.

The formula seems to have been waiting to be found by anyone who happened to study the question from the target end of the trajectory.

Relative accuracy of rocking bar and auto-sights:—

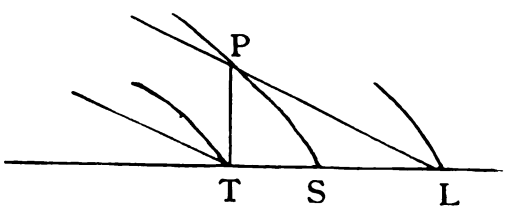

FIG. 2.

It will be convenient to deal with this in a similar way.

Suppose that when laying at the target, T, both sights are layed with an error that directs them on P. (fig. 2).

In the case of the rocking bar sights the trajectory will pass through P, and will reach the sea level at S.

The error produced $= \frac{TP}{\tan (\alpha + \theta)}$

In the case of the auto-sight, the line of sight will be raised to P, and it will meet the water at L, the trajectory being also, owing to the ratio of movement brought to L.

The error in this case $= TL = \frac{TP}{\tan \alpha}$

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∴ the ratio of inaccuracy with auto-sights, to inaccuracy with rocking bar sights

$$= \frac{TL}{TS} = \frac{\dfrac{TP}{\tan \alpha}}{\dfrac{TP}{\tan (\alpha + \theta)}} = \frac{\alpha + \theta}{\alpha}$$

=ratio of movement of auto-sights at the range in question.

In the above comparison the range to T is supposed to be accurately known. For a practical comparison of the two systems of laying the degree of accuracy with which the range can be found must also be taken into account.

Use of formula when testing layers:—

When testing layers the clinometer is placed on the gun; inaccuracies of laying are thus multiplied by the ratio of movement, and are easily read, but when the layer's "mean variation" or "probable error," measured on the gun, has been determined, it must be corrected to its equivalent on the line of sight, by dividing the ratio of movement.

The formula, $M = \frac{\alpha + \theta}{\alpha}$, will be found very convenient for this purpose.

Correction of auto-sights for change of M.V.:—

If a change has taken place in the M.V. of a gun, then, at any range R, in order that the gun may still give the same range, the elevation must be altered by a certain amount. Denote this amount by e.

While the gun elevation is altered by e, the sight will be altered by $\frac{e}{M}$ It will be off the target, and must be brought back on to it by a movement of $\frac{e}{M}$, given independently of the gun, and in the reverse direction.

To determine e, modern range tables give the number of yards change of range equivalent to 10 min. change of elevation, and also the change in range produced by 10 f.s. change in M.V.

Or ample accuracy will be given by the formula:—

$$e = \frac{2v}{V} E \text{.....(ii).}$$

Where E = the angle of departure, V = the M.V., and v = the change in M.V.

∴ we may say that the movement of the sight to correct for a change of M.V. of v. foot-seconds should be:—

$$\frac{\alpha}{\alpha + \theta} \cdot \frac{2v}{V} E \text{. .....(iii)}$$

A tabulated calculation accompanies this article in which the corrections required to be given to the sight, to compensate for a change of M.V. of 100 f.s., are worked out for a 6-inch Mark VII. gun

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firing full charge, at a height over sea of 107 feet.

The thick black curve, on the diagram that also accompanies this article, shows the results plotted. A correction given by the error of the day drum would be represented by a horizontal line, the diagram shows how far this drum meets requirements.

Correction of auto-sights for tide level:—

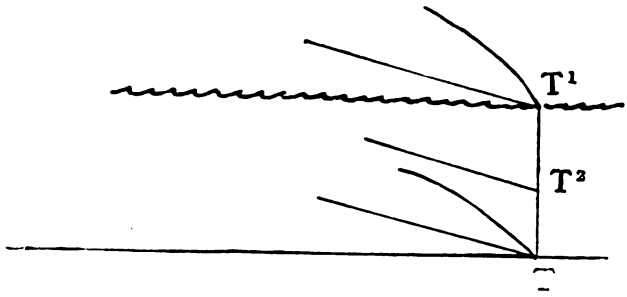

FIG. 3.

Suppose line of sight and trajectory to intersect at T, on mean sea level.

And suppose a change of tide to move T, through t feet, vertically to T^1. (fig. 3).

The adjustment for a change of tide should obviously be such that when the trajectory passes through T^1, the line of sight will also pass through T^1.

A height of t feet corresponds, at a range R, to an angle of $\frac{t \times 1146}{R}$ minutes.

By altering the gun elevation by this amount we shall raise our trajectory from T to T^1.

Simultaneously the line of sight will be raised by $\frac{1}{M}$ of this amount, to some point T^2, between T. and T^1. And, as the sight has also to be moved from T to T^1 through $\frac{t \times 1146}{R}$ minutes, there will remain to be given to the sight, by the tide mechanism, an angular movement of

$$\left(1 - \frac{1}{M}\right) \frac{t \times 1146}{R} \text{ minutes.}$$

$$\text{Now } 1 - \frac{1}{M} = 1 - \frac{a}{a+\theta} = \frac{\theta}{a+\theta} \quad \text{.....(iv.)}$$

∴ the movement required from the tide mechanism is:—

$$\frac{\theta}{a+\theta} \times \frac{t \times 1146}{R} \text{ minutes.....(v).}$$

Calculations in tabulated form accompany the article for a 6-inch Mark VII. gun firing full charges, 107 feet over the sea, for a change of level of tide of 10 feet. The plotted results have given the thin curve in the diagram.

On this diagram of the angular movements that *should* be given by a tide lever, it is convenient to plot a curve showing the movements that the tide lever actually produces. The vertical intervals

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between curves shows the uncorrected errors, which can be readily corrected into the equivalent yards by the formula, yards correspond- to each minute of error in laying

$$= \frac{8{\cdot}7 \left(\frac{R}{100}\right)^2}{h}$$

To get the movement actually given by the tide lever; first put it to mean sea level, depress the gun to each Q.E. on the " Table of Angles" and take a record of the corresponding angles of sight. Then set the tide lever to maximum rise, and again depress the gun to the same angles of Q.E. and take a record of the angles of sight. The difference between two angles of sight corresponding to the same Q.E. is the movement given the sight by the tide lever.

Care should be taken to avoid backlash, and the process should be gone through with the tide lever set for maximum fall of tide as well as for maximum rise.

Error produced by not adjusting for tide:—

A target T was at O, when the tide was at mean level, and has now been raised t feet (fig. 4).

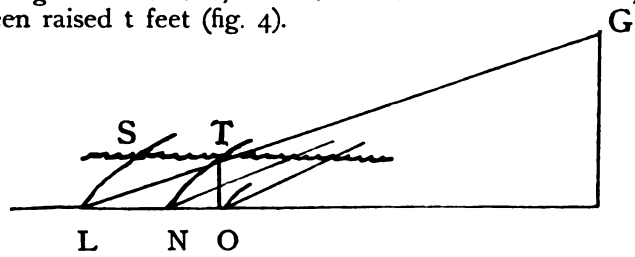

FIG. 4.

The line of sight through T meets the mean sea level at L. The trajectory will also pass through L, and will be intercepted by the raised sea surface at S causing an error in range ST.

If the line of sight had been raised $\frac{1}{M}$ of the distance from O to T, the trajectory would have been raised the whole way from O to T, and there would have been no error. Suppose the trajectory through T and the line of sight to intersect on the mean sea level at N.

After making the usual assumptions we may say that

$$ST = LN = LO - NO.$$

As regards LO we may say that the line of sight GT drops $(h-t)$ feet in R yards, and will drop t feet in $\frac{t}{h-t}$ R yards.

$$\therefore LO = \frac{t}{h-t} R.$$

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GN when it has reached the vertical line OT has dropped through $\left(h - \frac{t}{M}\right)$ feet in R yards. Between here and N it has to fall through $\frac{t}{M}$ feet. Therefore, by proportion:—

$$NO = \frac{\frac{t}{M}}{h - \frac{t}{M}} . \text{ R yards.}$$

$$\therefore \text{ the error } = \left(\frac{t}{h-t} - \frac{\frac{t}{M}}{h - \frac{t}{M}}\right) R \text{.....(vi.)}$$

If we worked out the error for a fall of the tide we should have found it

$$= \left(\frac{t}{h+t} - \frac{\frac{t}{M}}{h + \frac{t}{M}}\right) R.$$

And for a rough estimate equally applicable to rise or fall we may put the error.

$$= \left(\frac{t}{h} - \frac{\frac{t}{M}}{h}\right) R.$$

$$= \frac{t}{h} R \left(1 - \frac{1}{M}\right)$$

$$= \frac{t}{h} R \times \frac{\theta}{\alpha + \theta} \quad \text{(see equation iv.).}$$

$$= \frac{\theta}{\alpha + \theta} \times \frac{t}{h} \times R \text{.....(vii.)}$$

Error due to tilt:—

An auto-sight brings line of sight and trajectory together at any point along the line LNO which has owing to tilt of pivot been moved away, through the angle of tilt β, from the water surface ST.

Thus the line of sight and trajectory would meet at O, but a target T, at the same range as O will not be struck by the trajectory when the line of sight is directed at T. The trajectory and line of sight will meet at L, and the former will be intercepted bv the sea at S. The error in shooting being represented by TS.

If β is small compared with $\alpha + \theta$ as it generally would be, then we may substitute LN for TS, where N is the point where a trajectory through T would meet the tilted plane LNO.*

* If the tilt be forwards, LN is greater than TS, and vice versa.

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To get the trajectorv from O to T, the gun must have been raised through the angle B, and the sight through the angle $\frac{B}{M}$ in order to get it to N.

In order to get the sight from N to L we must, therefore, move it through $B - \frac{B}{M}$ or $B. \frac{\theta}{\alpha + \theta}$ minutes. (See equation iv.).

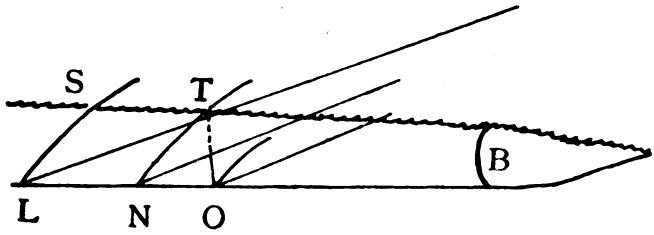

FIG. 5.

LN is equivalent to a layer's error of this amount and in yards would be given by the formula

$$\frac{\alpha}{\alpha+\theta} = \frac{\left(\frac{R}{100}\right)^2}{h} \times B$$

Specimen calculations of corrections required to be given to the auto-sight of a 6″ Mk. VII., full charge, 107 feet above mean tide, to compensate for (*a*) change of 100 f.s. in M.V., and (*b*) change of 10 ft. tide level:—

(*a*). Change of 100 f.s. in M.V. [M.V. = 2498 f.s.].							(*b*). Change of 10 ft. tide level.		
R Yards.	E mins.	$\frac{2v}{V} E$ mins.	α mins.	θ mins.	$M = \frac{\alpha+\theta}{\alpha}$ Ratio of Movement.	$\frac{2v}{V} \times \frac{E}{M}$ mins.	$\frac{\theta}{\alpha+\theta}$	$\frac{t \times 1146}{R}$ mins.	Required correction for tide. mins.
300	9	·7	409	9	1·02	·7	·028	38	1·06
700	22	1·7	175	23	1·14	1·49	·118	16·4	1·93
1,000	31	2·5	122	35	1·29	1·94	·223	11·46	2·53
1,400	43	3·4	87	50	1·56	2·18	·367	8·2	3·10
1,700	53	4·2	72	63	1·87	2·24	·466	6·75	3·14
2,000	64	5·1	61	78	2·28	2·24	·56	5·73	3·2
2,500	83	6·5	48	105	3·15	2·05	·682	4·58	3·12
3,000	103	8·3	41	137	4·34	1·92	·77	3·82	2·95
4,000	155	12·5	30	220	8·3	1·51	·88	2·86	2·55
5,000	216	17·3	24	336	15·9	1·09	—		
6,000	289	23	20	482	25	·92	·96	1·91	1·84
8,000	481	38·5	15	864	59	·655	·985	1·43	1·44
10,000	729	58·5	12	1282	108	·54	·99	1·15	1·14

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DIAGRAM OF CORRECTIONS.

To be given to the auto-sight of a 6-inch Mark VII. gun, M.V. = 2493 f.s., height over sea 107 feet, to correct for

(a). A change of 100 f.s. in M.V.

(b). A change of 10 feet in tide level.

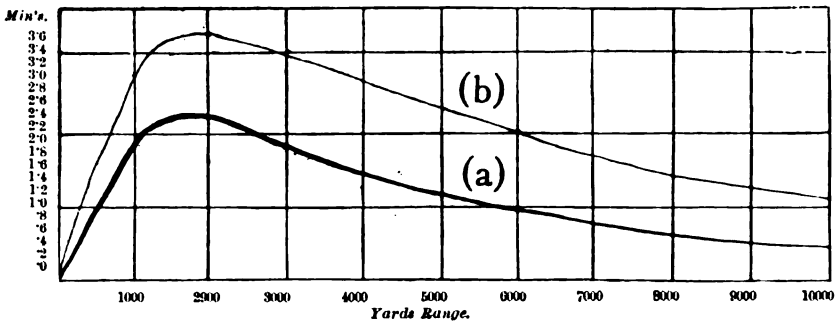

FIG. 6.

The thick curve, (a), shows changes required on the line of sight to correct for 100 f.s. changes of M.V.

The thin curve, (b), shows changes required to be given to the sight independently of the gun to correct for a 10 ft. change of tide level.

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MARSHAL NEY.

Prince of the Moskwa, &c.

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NAPOLEON'S MARSHALS.

3. NEY.

EX UNGUE LEONEN.

By CAPTAIN H. M. DAVSON, R.H.A.

WITH the exception of Napoleon himself, Ney is the Marshal whose name is most familiar to the casual reader of stories of the wars of the first Empire. In fact, to use a figure of speech which in this case is no exaggeration, every schoolboy knows it. On further enquiries, however, it will generally be found that the knowledge of his career is confined to his deeds on the field of Waterloo, his tragic death, and perhaps the story of the retreat from Moscow.

The following is a short account of some of his chief acts during a period of twenty-eight years of almost continuous fighting.

Michel Ney, Duke of Elchingen and Prince of the Moskwa, was born at Saarlouis in Prussia on January 10th, 1769, that is the same year as Napoleon himself. His father was an old soldier who had fought at Rossbach and who at the time was following the vocation of a cooper, and it was to his father's talk of the battles in which he had fought, that the future Marshal owed his inclination for a career of arms.

The boy Michel was educated by the Monks of St. Augustin, and from all accounts was not a desirable pupil. He was always in trouble, was extremely quarrelsome and lorded it over his schoolfellows whom he drilled like a regiment.

He was at first apprenticed to a notary, but gave that up, and seemed likely to become a rolling stone until he enlisted in a regiment of hussars at Metz in December, 1788. He became a sub-lieutenant in the 5th regiment of hussars in October, 1792, and a Lieutenant in November. Afterwards he acted as A.D.C. to Generals Lamarche and Collaud, and took part in the battles of Neerwinden, Louvain, Valenciennes and Grandpré. He was promoted Captain in the 4th regiment of hussars in April, 1794, and coming under the notice of Kléber, he was given a small command to harass the Austrian communications.

His first campaign of importance was in Belgium in 1794. He acted as Aide-de-camp to Kléber at the battle of Fleurus and was given command of a special corps raised to police the country. This

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appointment Ney at first declined but Kléber insisted, and after a gallant action at Pelumberg he was appointed Adjutant General. In the autumn, the authorities were so pleased with some cavalry work which he carried out that he was appointed chef de brigade.

He assisted Bernadotte in his operations at Heinsberg, which he carried by assault, and also at the passage of the Roer. Bernadotte in his report to Kléber said "I am bound to add in strict justice that he (i.e. Ney) greatly contributed to the success we have obtained."

Being sent forward by Bernadotte with a small force, he took Neuss by storm and drove the enemy back on Düsseldorf, which was then taken by Kléber, and he afterwards took a prominent part in the capture of Maestricht, and under Kléber before Mayence where he was severely wounded, the battle of Wurzburg and actions at Bamberg, Sulzbach, and the passage of the Rednitz.[1]

Ney was created a General in 1796, and took part in the battle of Altenkirchen on June 4th, in which he turned the left of the Austrian position and drove the enemy back on the Lahn.

In 1797 he was employed under Hoche[2] as head of a Corps of Hussars. In one of the actions his horse fell during a charge, and after a desperate resistance he was taken prisoner. As soon as Hoche heard of it, however, he negotiated for his exchange. After the Treaty of Campo Formio, Ney became commandant of Divisional Cavalry at Lille.

In the spring of 1799 the French were forced to retire behind the Glatt[3] in front of an Austrian Coalition. Ney took command of the advance posts and fought a fierce action at Winterthur, where he was shot through the thigh and wrist and received a bayonet wound in the foot. This forced him to hand over the command to Gazan and retire from the army. He rejoined in two months, and was made General of Division by the Directory—a position which he as usual attempted to decline. After assisting at a sharp fight on the Aar in August, he set off to join the newly formed army of the Rhine at Mannheim.

On the 27th he took a small force to Heilbronn, where, chiefly by artillery fire, he defeated the Austrians and became master of the place. He then pushed on to Ludwigsberg, but was brought to a stand and obliged to retreat. He retired successfully on the Rhine, but the French were driven out of Mannheim, and Ney was again wounded. The movement had, however, helped to relieve the pressure on Masséna in Switzerland. Later on General Molier was recalled to France, and Ney was appointed to the command of the army. He accepted it unwillingly and took the doubtful course of informing his subordinates that he did so. It was neither a happy nor successful command. The army was bad and disaffected, and until after Masséna's victory at Zurich he adopted a waiting policy—

[1] "The General who commands an army in which you are employed is a fortunate man."—Bernadotte to Ney, 5th October, 1794.

[2] The pacifier of La Vendee. He commanded the expedition to Ireland in 1796. Died suddenly in the camp at Wetzlar, Septemper, 1797.

[3] A tributary of the Rhine North of Zurich.

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perhaps by force of circumstances. General Lecourbe then appeared to take command, and Ney was freed to indulge in some minor operations against Prince Hohenlohe which ended in his reoccupation of Heilbronn.

In the campaign of 1800 he took part in most of the skirmishes which preceded the battle of Hohenlinden. On November 29th, the Arcnduke Ferdinand crossed the Isar and debouched upon the French left at Ampfing. Ney resisted during the whole day, but was at last forced to retire, having however taken 1,000 prisoners and broken the force of the Austrian attack. He retired to the left of Moreau's line at Hohenlinden and commanded there during the action of the 3rd December, when he manœuvred right round the enemy's flank and joined Richepanse in rear.

In February, 1801 came the Peace of Lunéville, and Ney returned to Paris. Napoleon had by this time made note of him as a man of exceptional ability and tried every means to secure him as a supporter for good. On account of this the attachment which Ney formed for Mlle. Aglaé Anguié, a friend of Hortense Beauharnais was most welcome to him. The greatest opposition came from the lady herself who professed indifference to the General and asked her parents what was the use of marrying a man who spent his time at war and whom she could never see. The crisis came at a family dinner when a friend of M. Anguié was recounting how in a recent battle, Ney had had seven horses shot under him, " Onze, Monsieur," interjected Mlle. Aglaé, and her father laughingly remarked that he considered the affair settled, and so indeed it was.

She became a devoted wife to the future Marshal, a friend of Napoleon and of his nephew, Louis Napoleon, afterwards. According to the Duchess of Abrantes she was a very accomplished lady with great charm of manner. They were married in July, 1802, at Chateau de Grignan. Napoleon's wedding present was a handsome jewelled sabre captured at Aboukir. Thirteen years later it became the fatal witness which delivered Ney to his enemies.

In October, Ney was made Minister Plenipotentiary of the Swiss Cantons, and was from all accounts a diplomatic success. In December, 1803, he became Commandant of the Camp of Montreuil, and early in 1804 was created Marshal and granted the Grand Cordon of the Legion of Honour. He then commanded the 6th Corps of the Grande Armée.

In the March of 1805 he moved from Montreuil and crossing the Rhine between Lauterburg and Durlach near Carlsruhe had some difficulty with the Elector of Bavaria and the French Minister there, when the iron hand seems to have thrown off the velvet glove. As a result he occupied Stuttgart and then advancing forced the Danube and gained possession of Gunzburg, having severely defeated the enemy occupying the place and capturing prisoners and guns. He then turned towards Ulm, following the left bank of the river and guarding the northern exits from the fortress.

At this time the Russians were reported on the Inn, and Napoleon

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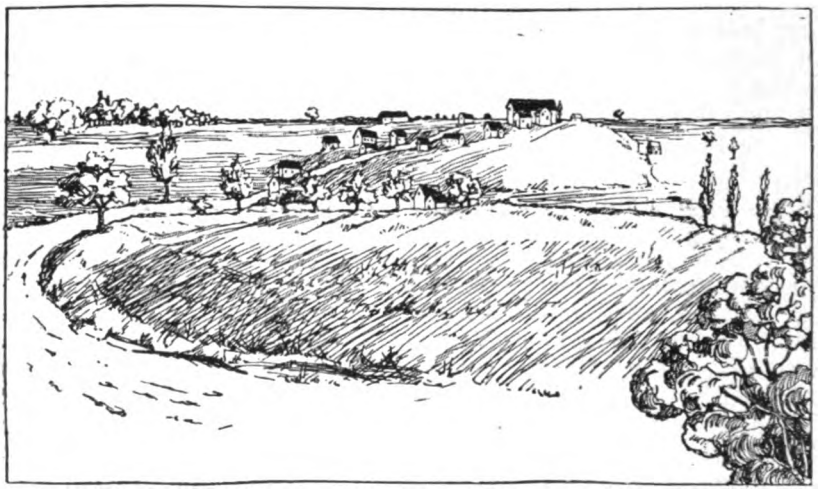
himself turned against them leaving to Murat the command of the army surrounding Ulm. Murat immediately called Ney across the river. The latter protested, but finally obeyed with two divisions. The Austrians immediately crossed to the left bank (11th October) and attacking Ney's third division (Dupont[1]) at Hasslach drove it back on Brentz. Reich seized Elchingen and damaged the bridge, whilst fortifying the village which stands up above the valley of the Danube.



Ober Elchingen from the North end of the bridge.

As soon as Ney heard of it, he supported Dupont and appeared on the right bank before Elchingen. His soldiers with great bravery crossed the damaged bridge under heavy fire and gained the other bank. Ney knowing Dupont to be somewhere in rear, feinted with his right, and then carrying the bulk of his force westwards between the heights and the river, he drove in the Austrian's right at the same time that Dupont arrived from Albeck in the rear. The Austrians were defeated and dispersed after a desperate resistance. They retired partly on Langenau and partly on Jungingen, whilst Ney turned towards Ulm and joined Lannes in the attack on the Michelberg, October 16th, which, as well as the advanced works of the town, was carried after severe fighting. In the week, Ney had captured 14,000 men and ten standards. His corps then led the entry into Ulm.

It was a fine piece of work on the part of Ney's corps, especially as rations were scarce; indeed both de Ségur and de Fezensac in the memoirs allude to the starved condition of the men. Berthier wrote to Ney on October 4th, "with such officers as you . . . . we shall do wonders," and Ney had certainly fulfilled all expectations.

After the capitulation of Ulm, Ney's corps was diverted into the

[1] Afterwards disgraced by the capitulation of Baylen in the Peninsula.

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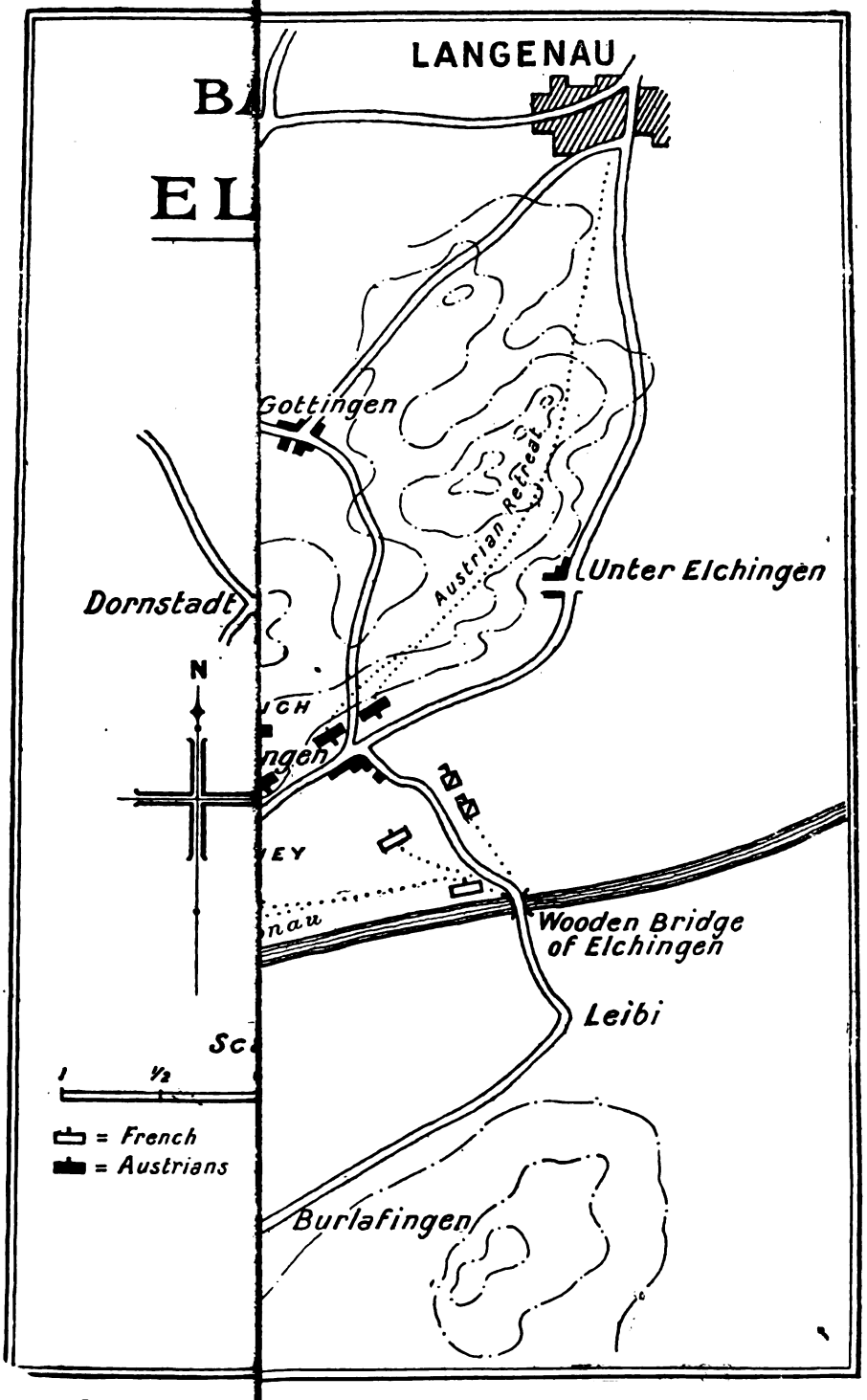

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Tyrol, where he chased the Archduke John from Charnitz to Innsbruck. He then entered Carinthia and operated there until the Peace of Pressburg, when the armies turned homewards.

When the campaign of 1806 opened in October, Ney's corps numbering 20,000 men was at Nuremberg, and he moved up into his place *via* Munchberg, Auma Gera and Zeitz, covering about 95 miles in six days.

The battle of Jena opened about 9 a.m. Ney came up somewhat late as he had had to force the Muhlthal defile in the face of heavy cavalry charges. Once he and Murat got into position, however, the fight was as good as over. After the battle he followed on after Murat, captured Magdeburg (8th November) and Thorn, forced the Vistula and occupied Ryppin. He then suffered a check at Soldau, but was successful in skirmishes at Mlawa and Lanterbach. He was then forming the left of the French army—the pivot on which Napoleon turned during the manœuvres of 1807.

We get a curious portrait of what he was about this time, from one of his Aides-de-camp, M. de Fezensac. According to him, Ney was of a reserved if not gloomy disposition, he rode alone hour after hour, and spoke to no one except to give orders, nor did he ever ask any of his Staff to dine with him in camp or bivouac. It may have been due to the responsibility of manœuvring a large corps, which practically never lost touch of the enemy for nine months—it may have been, as de Fezensac suggests, that Ney felt himself not born to his high estate—it may have been natural temperament. Perhaps the second supposition is the best. Napoleon himself, with all his admiration of Ney, frequently mentioned his lack of breeding and in fact on one occasion at St. Helena referred to his valour as "the courage of the *Canaille*."

Such as it was, it was the courage necessary in this time of war, and no Marshal—not even Murat, who was then at his best—came out of the campaign of 1806-7 more gloriously than Ney.

He began the campaign of 1807 by a brilliant pursuit of the Prussians from Dutch Eylau, and attacking the rear guard on 5th February, he cut the cavalry to pieces. Two days after the battle of Eylau he stopped the Russians from gaining the road to Koenigsberg. On March 3rd he attacked and captured Gunstadt. At Gunstadt also, in June, when his corps was exposed beyond the Passarge and attacked in front and on both flanks by greatly superior numbers, he got it out of the difficulty with great skill and daring, and retired first to Ankendorf and then across the Passarge at Dippen.

At Friedland on June 14th he opened the ball with his corps at 5.30 p.m., his flanks being all the time harassed by Cossacks. He nearly lost his corps, which was heavily involved as it was entering the ravine which surrounds the town. He was however extricated by Dupont's brigade, and finally charging with the bayonet drove the enemy into the river Alle. It was after these battles that Napoleon called him Le Brave des Braves, a name by which he has always been known since. The men of his corps had a sincere admiration for him—in fact he was known amongst them as "the Red Lion"—a delicate reference to his mass of fair hair.

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He was sent to Spain in 1808, when the failures of King Joseph and Dupont were reanimating Spanish feeling, and arrived in time to take part in the battle of Logrono, and commanded the 6th Corps of the army with which Napoleon advanced on Madrid. This corps formed part of the force which followed Sir John Moore to Corunna. After the departure of Napoleon he did not get on well with Soult, especially at the time when Soult was suspected of aiming at the throne of Portugal, and after the retreat of the latter from Portugal the feeling broke out into open quarrel. Afterwards he joined with Junot in some operations on the Agueda, which on the arrival of Masséna, ended in the capture of Ciudad Rodrigo, which capitulated to him July 11th, 1810. He followed this up by defeating Crauford on the Coa, where nothing but the excellence of the British rank and file and lack of co-operation of the French commanders saved the famous Light Division from being utterly destroyed by the superior numbers of the enemy.

Then followed the advance into Portugal. It was not a happy one. First Masséna chose the wrong road, then his Generals Ney, Junot, and Reynier fell out with him over the bad handling of the baggage convoy[1]; and this feeling was further accentuated by Masséna inviting his mistress to join them at dinner. Ney, having handed the lady to the table by the tips of her fingers, ignored her for the remainder of the evening, and the dinner instead of producing harmony between the Commander-in-Chief and his Generals had the opposite effect. Then followed the disjointed attack on Busaco—the worst battle Masséna ever fought. Afterwards came the wait in front of the lines of Torres Vedras, and then in the following spring, the retreat from Portugal.

Ney was at his best in these retreats. The most brilliant tactical efforts of his career were all rear guard actions, and but for its effects being marred by acts of insubordination the retreat of 1811 would have given him a glorious reputation even if he had never fought again. He fought skilful actions at Pombal, March 5th, Redinha (12th), and then at Condeixa, which he left too soon for Masséna. He fought again at Cazal Nova and at Foz d'Aronce (15th). This latter he fought against Masséna's orders and it nearly ended in disaster for him.

Following on this at Miranda after a hot dispute between the two Marshals, Masséna deprived him of his command. The dispute arose over the subsequent movements. Strategically, Ney's plan of retiring on Almeida was inferior to Masséna's of a concentric movement on Pena Macor which would have enabled him to join with Soult and threaten Wellington's line whilst still remaining in Portugal. Ney's point was that the country towards the Elga was barren and the army was tired both of short rations and Portugal. This was true, but it was not a remark which one would have expected from a warrior like Ney. After the scene at Miranda he returned to Paris and Masséna was forced to return to Spain.

Then followed the Russian campaign of 1812, that campaign which ended so disastrously for the Emperor and so gloriously for

[1] Colonel Trant with some Portuguese militia nearly captured the baggage, 18th September.

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Ney. He was given command of the 3rd Corps, which was one of those attached to Napoleon's own command. He took part in the battle of Smolensk on August 17th and 18th, and the following day commanded in a fierce attack on the Russian rear guard at Valoutina; but for a strange apathy on the part of Junot who refused to join in, and a mistaken order from Morand, Ney might have caused the Russians a severe disaster; as it was Barclay de Tolly made good his retreat. Each side lost about 7,000 men, but the French in addition lost Gudin, Davout's famous divisional General, who had been despatched to Ney's assistance. At Borodino, Ney commanded in the centre and his troops heroically attacked the entrenchments which they carried after severe fighting, crossing the ravine which runs at right angles to the river Kolotza he carried the village of Semenovskoie by storm, and then wheeling to the left supported Eugéne in his attack on the Great Redoubt which commanded the centre of the Russian position. The fall of this point virtually decided the battle.

For his prowess at this battle, Ney was created Prince of the Moskwa, a name taken from the river which flowed in rear of the Russian position.

The French then advanced on Moscow and the subsequent events do not concern this Marshal. Napoleon left the city on October 19th, and Ney took over the duties of rear guard commander on November 3rd, and for five weeks this heroic man guarded the rear of a beaten army with troops stricken with cold and hunger, fighting in driving blizzards, retiring over a country bereft of food and deep in snow, crossing icy rivers in the face of immensely superior numbers, but always showing face to his pursuers, and by his own determination and physical courage putting heart into his rapidly diminishing army which on two occasions wasted away entirely, only to be immediately reformed by the tireless exertions of its chief.

Ney left Smolensk on the 19th November and next day was severely checked at Krasnoi, stopped, and separated from the main army. When he heard that Ney had been cut off, Napoleon was greatly upset and is reported to have exclaimed "I would give all my fortune to save him."

To regain the bulk of the army which had passed on Ney was compelled to make a detour, and moving North he reached the Dnieper, which he crossed, but had to abandon his guns. Having waited for some hours on the far bank for his stragglers, he next day struck the Vitepsk road, and much to the delight of the Emperor, rejoined the army at Orcha, having marched twenty leagues harassed by Cossacks, and lost nearly 5,000 men.

Then followed the passage of the Beresina. Ney's corps was passed over early leaving the comparatively fresh corps of Victor to cover the passage. He resumed his place in the rear immediately however, and fought at Molodetschno (December 4th), and finally reached the Niemen at Kowno on the 18th, but his rear guard had melted away. When the Russians attacked the town however, he collected a few hundred men and defended it until the remnants of the French had left, and then, and not till then, he gave up the contest and crossed the bridge. He was the last soldier of those who

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were left of the Grande Armée to leave the country of so many disasters.

Some time later, a tattered, unkempt man, with his face covered with hair and black from exposure, walked into the apartments of General Matthieu Dumas at Gumbinnen—a town separated by 100 miles of frozen forest from the hated Russian frontier—"Who are you"? asked the General. And the visitor replied, "I am the rear-guard of the army—Marshal Ney."

Ney was taken back to Paris and assisted the Emperor in his efforts to drill a new army. Ney with his corps appears to have been very successful; indeed, after his first engagement in the following year he wrote to the Emperor "These children are heroes, with them I can carry out anything you may command,"—and he very nearly did so; certainly his failures were not the fault of his troops.

He crossed the Saale with his new corps on April 29th, and advancing on Lützen he met the Russian cavalry, threw them back and captured Weissenfels. His corps was then posted at Lützen to protect the French right and was attacked by the Allies who were advancing on the Upper Saale. The battle of Lützen which followed raged round five villages, and three of these had been captured before Ney, who was conferring with the Emperor, arrived. On his arrival, after great efforts, he recovered Rahna and Klein Gorshen, but his young troops were then exhausted and he lost Rahna until the arrival of Napoleon and the other corps forced the enemy to retire. Ney was delighted with the deeds of his conscripts. "After two defeats," he wrote to General Dumas, "even veteran troops might have hesitated to attack again, but I led these youths five times against the position, and their enthusiasm and perhaps inexperience served me better than more seasoned troops." Ney was then sent to Torgau, en route for Berlin, but was recalled by the Emperor to take part in the battle of Bautzen. He arrived on the right flank of the Prussians on the evening of the first day of the battle (May 20th), and next day drove them in on the centre. Here for once Ney was guilty of tactical weakness and overcaution, and allowed Blücher and Wittgenstein to retreat into Silesia. His corps then took post on the Bober and assisted in the operations which drove the enemy eastwards beyond the Katzbach, after which he commanded the right at the battle of Dresden.

On the 3rd September he joined Oudinot at Wittenberg, whither the latter had retired after his defeat at Groos-Beeren, and advanced on Berlin. He was, however, attacked by Tauenzein and Bülow, the divisional Generals of his old tutor Bernadotte, at Dennewitz, and utterly defeated after four hours hard fighting with a loss of 10,000 men. He was forced back across the Elbe by the superior forces of Blücher and Bernadotte and joined the Emperor to take part in Leipzig, after which his corps retired to the Rhine, to Nancy, and in the spring of 1814 to Châlons.

The history of Ney in the campaign of 1814 is the history of Napoleon himself, for it is remarkable that in a war in which the Emperor made considerable use of detaining and detached forces, he

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always kept Ney with him—Mortier, Macdonald, Marmont, and Victor, were all detached in turn, but never Ney. The battles he took part in—Brienne, Le Rothière, Montmirail, &c., were all those of Napoleon and need not be dealt with in this article. At length, at the end of March, all the Marshals and the Emperor himself felt the contest at an end, and Ney was one of the Commissioners sent from Fontainebleau to treat with the Emperor of Austria concerning the abdication of Napoleon. He himself urged him to do so and after the document was signed, he sent in his adhesion to the provisional government.

On the return of Louis XVIII he was made a Peer of France, and at first settled down to the life of the Court of the Bourbons. He seems to have got disgusted with this, however, and retired to his place at Coudrot near Chateaudun.

On March 1st, Napoleon landed at Golfe-Juan and Ney was thrown into a state of lively indecision. In his anxiety he appealed to Soult, then Minister of War, but he was apparently in the same state, as he gave nothing but a curt and evasive answer. On the 6th Ney was ordered to take command of 4,000 men at Besancon, and he then decided for the Bourbons and went to Paris and had an audience of the King in which he made use of his oft misquoted words "Bonaparte deserves to be put in a cage." He concentrated his force at Lons-le-Saulnier, but, finding all his troops in favour of their old Commander, his good resolutions gave way, and he set off to join Napoleon, and reached him at Charleroi on June 15th to the great joy both of the Emperor and the army.

He was given command of the first and second corps and the cavalry of the guard, and sent to drive the English back on Brussels and take up a position at Quatre Bras. This he failed to do.

He drove in a force of the Allies whom he met at Frasnes, but only carried on a portion of his troops to Quatre-Bras and then hesitated to attack in the dusk of the evening a force evidently superior in strength. He thus failed to place himself between Wellington and Blücher on the 15th, and next day it was too late. In discussing the campaign afterwards Napoleon blamed Ney for his excessive caution.

At 2 p.m. next day the battle of Quatre-Bras began. It is unnecessary to describe it except to say that when he had been told by the Emperor that all depended on him, and when he could not obtain the assistance of d'Erlon's corps, he entirely lost his head, and in the end failed to dislodge the British from their position. Ney had two horses killed under him and lost over 4,000 men. The Allies' loss was somewhat greater. Next day Wellington retired to the Waterloo position.

At 1.30 p.m. on the 18th, Ney commenced the main assault on the British position at La Haye Sainte. This was repulsed. Two hours after he attacked a second time, and on the British troops retiring before the terrific artillery fire he ordered those terrible cavalry charges which are such a feature of the battle and which were repulsed again and again. The picture we get of the man at this time, black with powder, his brilliant uniform in ribbons, his third horse killed

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under him, standing in the battery and striking a British gun with his sword in agony of failure is almost pathetic in its grandeur. At last La Haye Sainte was taken, and Ney perceiving the line wavering sent for reinforcements, which were refused. It is quite possible that had Napoleon given him the Guard at this time, the story of the battle might have been changed. He did command them an hour later in that last desperate attack, but it was then too late, and all that the remnants of this unique force could do was to cover the rout of the broken army.

Thus ended the last fight of one who had given his life to fighting, and had he died it would have been a worthy end to such a career, but it was not to be.

On the second abdication he retired to St. Alban, near Roanne on the Loire, and then to the Chateau d'Aurillac, where he lived incognito.

One day a servant discovered a jewelled sword lying on his bed and reported the occurrence to the police. They promptly arrived at the conclusion that the man at the Chateau must be either Murat or Ney and ordered his arrest.

His trial was the result of political intrigue. His death, which followed, the sop of the renegade Imperialists to foreign influence. To give the details of his trial would be tedious. He was strongly defended by counsel and witnesses, but the power against him was too strong.[1] He was shot in the garden of the Luxemberg at dawn on December 7th, and his body was interred in the Eastern cemetry of Paris.

Such was the end of the Bravest of the Brave. "There fell like a traitor one who had gained five hundred battles for France and never one against her." He died because he attached himself to the man to whom he owed all, rather than to the upholders of the *ancien régime* which he, like most Frenchmen, detested.

In 1853, France awoke to the wrong she had done to one of her most famous and devoted sons, and raised a statue to him. It still stands on the spot where he died on that winter morning in the Luxemberg Garden.

1 Wellington was appealed to in his favour, but declined to interfere.

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THE RHINE.

By T. MILLER MAGUIRE, M.A., LL.D., Barrister-at-Law.

*(A Lecture delivered at the Royal Artillery Institution, Thursday, 14th November, 1907).

Brig.-Gen. W. Tylden, R.A., in the Chair.

THE LECTURER: General Tylden, Ladies and Gentlemen; when the excellent Secretary of this Institution, (lecturing to which is a highly honourable distinction), selected the Rhine as a subject for this lecture, I felt that the greatest difficulty would be comprising almost limitless material within the bounds of a single discourse.

The dwellers by the banks of no other river, not even the Ganges or the Euphrates or the Po or the Tiber have witnessed such a perpetual series of migrations, and ebbs and flows of humanity, generation after generation, such marvellous displays of the energy of the craft and skill of the wisest and the most cultured, as well as the very fiercest and most brutal of mankind.

The Rhineland seems to be an epitome of the commercial, the military, the poetic, the ecclesiastical, and the artistic energies of the very pick of all races. When we were boys we used to laugh at the stories of Herodotus concerning the vast hordes of Xerxes and the migrations of the peoples dwelling between the Indian Caucasus and the Levant and the Caspian and Black Seas, and the Persian Gulf and the Valley of the Nile. His wildest exaggerations are trifles compared with the true records of the Rhine banks and the struggles for the possession of Gaul by Romans and Teutons, Alemani and Franks and Saxons, High Dutch and Low Dutch, ancient Huns under the wild Attila, and modern Germans under the impetuous Blücher, the torpid Schwartzenberg and the sage Moltke. No wonder at their eagerness to subdue or possess this lovely and teeming land, the brightest of all territories, the source of such exuberant fertility that, as Arthur Young said "If you tickle it with a hoe it will laugh with a harvest." All phases of heathen aims and civilisation from the Ural Mountains westwards have settled on the Rhine banks. Every type of fortification, palisade, and Devil's Wall and inundation systems, Roman entrenchments, feudal castles, the art of Carmontaigne and Vauban and Cohorn, and the vast modern entrenched camps rivalling the most stupendous works of Drusus and Agrippa and the surprising masterpieces of Hadrian and Antonius have been constructed and have been levelled to the ground on this area of grandiose operations. But art was expended in vain attempts to protect peaceful citizens from raiders whose homes were in the

*This Lecture was delivered extempore and illustrated by wall maps and various smaller maps, but it can be followed by the aid of any good Atlas.

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forests of Scythia, or by the banks of the Danube and Elbe.

So all varieties of Christian thought and speculation have striven for mastery in the temples and seminaries which cherished knowledge in the Dark ages and develope science in our day. The Rhine was the very centre of the commerce of Europe in the days when the merchants of the Hanseatic League were the companions of Kings. A glance at the maps[1] so kindly presented to us by leading merchants and by agents of international communication will bring to your imagination, as well as to your eyes, most startling evidence that the lower Rhine, indeed all the Rhine between Cologne and its mouth and the neighbouring territories for scores of miles, are now even more flourishing seats of commerce absolutely, and as compared with France and England and Italy, than the Low Countries, Flanders and Holland, were in the middle ages, and the Dutch Republic was in the seventeeth century.

Fain would I, as a pure Celt by descent, ignore if I could the commercial and strategic importance of the Teutons, whose homes are by this exulting and abounding river, and confine myself to the poetry and romance with which its every bend and tributary are identified, from the glaciers of Switzerland to the Lowlands, where Vandyke and Rubens did with colours what the poet does with words. But in this hall I must not forget strategy and commerce. In truth my personal sympathies and racial sympathies would, of course, be with the Gauls rather than with the Germans. I take it that some of my ancestors must have been chased, generation after generation, from the rich plains of eastern Europe to western bogs amidst the melancholy ocean, by the ancestors of some Saxons in this room. I will have to wind up this lecture by lavish references to the commerce of the Rhineland and the Ports of the German Sea and the Harbourage of the Frisian islands, so I will ask the General's permission to make references now to poetry, which is ever at the service of nature and mankind, and celebrates the triumphs of war and art and industry, clothing the "palpable and the familiar with golden exhalations of the dawn." Folk songs and poetry of all kinds reveal the very Soul of a race.

The poet Victor Hugo explains why, to the Celtic Gaul as well as to his Frankish conqueror, the river was not only a bulwark of defence, but also as a source of pride as a "thing of beauty and a joy for ever." Its legends enraptured him, he fancied, like myself at the same spot, that he could hear the song of that lady of the rock, the Lorelei, and had he been the boatman he would have gladly steered to ruin in order to hearken to her syren-like strains. His mind was coloured by every line of the landscape, he recalled how the martial Constantine near Sinzig, in a rapture of enthusiasm, hailed victory under the sign of the Cross "in hoc signo vinces." Nor was it for nothing but a passing gaze that he read at Bingium (Bingen) "here the road commenced by Charlemagne was finished by Napoleon"! Here is a fine passage, a piece of his prose poety. "Le Rhin réunit tout. Le Rhin est rapide comme le Rhône, large comme le Loire, encassé comme Le Meuse, tortueux comme la Seine, limpide et vert comme

[1] Messrs. Cook & Co. and the North German Lloyd kindly supplied numerous copies of their maps.

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la Somme, historique comme le Tibre, royal comme le Danube, mysterieux comme le Nil, pailleté d'or comme un fleuve d'Amerique, couvert de fables et fantômes comme un fleuve d'Asia."

In 1813, the year of Germany's deliverance from Napoleon, the subject of the most popular song was the Rhine, which has always been associated with the German's patriotic utterances. When, in driving Napoleon back into France, the German soldiers saw the Rhine for the first time, they are said to have broken out into uncontrollable joy. Tears trickled down many cheeks, and the enthusiasm passing from rank to rank, soon a hundred thousand voices joined in one "hurrah"! At this time the Germans began to cast their eyes on the country that lay beyond the Rhine, as the following lines will prove:—

The Rhine shall no longer be our boundary;
It is the great artery of the state,
And it shall flow through the heart of our Empire.

On this favourite subject the song of Niklas Becker

"O no! they shall never have it.
The free and German Rhine,"

long possessed the greatest popularity. It is said to have been set to music by no less than seventy different composers, and owed its inspiration to the preparations and menaces of Thiers, in 1840. Arndt sent Becker a congratulation on his successful composition:—

"At once from North to South,
Its echo clear and strong,
Became in every German's mouth
The nation's charter song."

Becker's song subsequently yielded in popularity to one by a man but little known, named Max Schneckinger.[1] This famous "Rhine Watch," became the lyrical watch-word of the Germans in the war of 1870. The musical setting of the "Rhine Watch" is far superior to any of the seventy to which Becker's song is sung, and is one of the causes of the great hold it has on the Germans. The words of the song, as far as is possible in another tongue, shall speak for themselves.

WHO'LL GUARD THE RHINE?

A cry ascends like thunder crash,
Like ocean's roar, like sabre clash:
"Who'll guard the Rhine, the German Rhine,
To whom shall we the task assign"?
Dear Fatherland, no fear be thine,
Firm stand thy sons to guard the Rhine.

"While there's a drop of blood to run,
While there's an arm to bear a gun,
While there's a hand to wield a sword,
No foe shall dare thy stream to ford."
Dear Fatherland, &c.

[1] See Davenport Adams' "Rhineland."

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The oath is sworn—the masses surge,
The flags wave proudly—on we urge;
And all with heart and soul combine
To guard the Rhine, the German Rhine.
Dear Fatherland, no fear be thine,
Firm stand thy sons to guard the Rhine.

But the English poet Lord Byron, whose genius is immortal, and whose Childe Harold is a masterpiece of description, gives stanza after stanza of Canto iii to the Rhine, and indeed his descriptions of the baronial castle of Ehrenbreitstein, of the scene near Bonn, of the tomb of Marceau are most admirable, and if I had time to read them would delight my audience. What a pity that the gems of English literature were excluded from the education of officers to please pedants:—

"True Wisdom's world would be
Within its own creation, or in thine,
Maternal Nature! for who teems like thee,
Thus on the banks of thy majestic Rhine!
There Harold gazes on a work divine,
A blending of all beauties, streams and dells,
Fruit, foliage, crag, wood, cornfield, mountain and vine,
And chiefless castles breathing stern farewells
From grey but leafy walls, where Ruin greenly dwells."

Strategy:—

But I must turn from poetry to history, and here I am bewildered as to where to stop. The passages of the Rhine alone would occupy hours, and some of them such as those of Turenne and of Moreau, 1796-7, described by Hamley are even now models for students of the art of war.

In the time of the Romans, the Rhine was the boundary of Gaul, and the French of Celtic or German descent have throughout their history, since the days of Cæsar, regarding it as their national boundary. This theory was admirably discussed and repeated by Burke in his letters on a "Regicide Peace." Indeed, it has no foundation in history, as between the death of Charlemagne and the close of the seventeenth century the left bank of the Rhine from the frontiers of Switzerland to Holland was occupied by Germans, and although the Belgi race were the fiercest and hardiest of Gauls, certainly the Dutch were of German descent. Louis XIV, in 1681, took Strasburg on the Ill, two miles from the Rhine, but an important Rhineland fortress since the Roman times. Burke's eloquent refutation of the French claim was ignored by the Republican Generals who conquered Belgium, Holland, and the left bank from Lauterberg to Düsseldorf, 1793-6, and in Napoleon's time the strategical advantage gained by the French by the possession of the whole river was of the utmost importance and value especially in the campaigns of 1805 against Austria, and 1806 against Prussia.

The name of Julius Cæsar still bestrides the world of history

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like a colossus, and to-day our guest from North Germany bears the titles of the Cæsars. His conquest of Gaul was the salvation of the Roman Empire, but it brought his legions into the woods and marshes of the Lower Rhine, and of the Scheldt and the Meuse, and, while he gained immortal fame and command over all his rivals by his Gallic enterprises, his excesses and ruthless butchery and plundering excited the horror of even his fellow countrymen, whose Empire he was expanding, and whose venal pockets he enriched. But he collided with the Germans and not only drove them across the Rhine, but also built a bridge over the river near Bonn, a marvellous undertaking for the period, the river being about 1,300 feet wide at this point. There are various theories about the locality of the bridge; some say it was near Mayence, but the Bonn theory is now generally accepted. "Some German tribes, the Usipetes and the Tenchteri had crossed the Rhine not far above its mouth, crowded from their homes by the Suevi, the most powerful of the Teutonic races. Once in Gaul they had advanced into the Vosges country."

Cæsar's plan necessitated a check to these barbarians who had over one hundred thousand warriors. From his winter quarters near Amiens, he marched to the Meuse in May, 55 B.C. In the ensuing negotiations, the enemy treated Cæsar's claims with duplicity. So, confessedly, did he, and when their ambassadors next came to his camp, he detained them, put his legions in order of battle, marched upon the unsuspecting legions of Germans, surprised and put the entire body—four hundred and thirty thousand men, women and children, to the sword. A few escaped across the Rhine. This is unquestionably the most atrocious act of which any civilised General has ever been guilty. It accomplished its end, but this fact does not palliate its enormity. Cæsar then built his celebrated bridge and crossed the Rhine. The Suevi retired into the forests beyond their domain. After eighteen days he returned and broke down the bridge. The foray had no useful results.

The destructive tactics of Cæsar's Generals at Charleroi led Napoleon to contrast ancient war with modern very skillfully "si l'on disait aujourd'hui á general. 'Vous avez comme Ciceron sous vos ordres 5,000 hommes, 16 pieces de canon, 5,000 outils de pionniers, 5,000 sacs á terre; vous serez a portée d'une foret dans la terrain ordinaire; dans quinze jours vous serez attaqué par une armée de 60,000 hommes ayant 120 pieces de canon; vous ne serez secouru que quartre vingts ou quartre vingt seize heures apres avoir étè attaque' Quels sont les ouvrages, quels sont les traces, quels sont les profils que l'art lui proscrit? L'art de l'ingenieur a-t-il des secrets qui puissent satisfactaire á ce problem?"

As to the bridge, I translate Colonel Henrard's account:—

The most celebrated of the bridges constructed by Cæsar is the one by means of which he crossed the Rhine, on the territory of the Ubü. People have wished to consider it as a bridge of piles, that is a mistake. The careful details entered into by Cæsar prove clearly that as a matter of fact it was a bridge of buttresses. The dimensions of these are superior to those of our war equipage, but the greatness and depth of the river made this a necessity."

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Let us recall Cæsar's description, *see* Gallic War, LIV.:—

"They joined together, he says, by cross-bars, two feet from each other, two beams slightly pointed at one end, they were a foot and a half square, and of a height in proportion to the depth of the river. These coupled beams were taken down the river with the help of machines, and fixed, not vertically, but obliquely, turned against the current to keep them in place up stream, and following the flow of the water to keep them in place below stream. On the four beams, a fifth was placed two feet square, by means of two strong bolts; the whole was so well bound that the force of the current added to its solidity. To guard against the pressure below stream, inclined stakes were driven in which served as buttresses. Other stakes placed above the bridge stopped the boats and tree trunks which the barbarians sent down with the tide in order to wreck the bridge."

But the Romans were very heavily handled in the reign of Cæsar's successor Augustus. General Varus crossed the Rhine, was drawn into the Teutoberger Wadl, and his legions massacred by Herman or Arminius. Thus A.D. 9, finished the expansion of the Romans beyond the Lower Rhine, they never conquered North Germany. The Rhine, however, was a leading artery of the Roman dominion for centuries, and their fortresses which were most elaborate, i.e. at Mayence (Magontiacum), Colonia (Cologne), Aggrippina, and other places were used as sally posts against the barbarian hordes. Hadrian adopted the system of forts and walls and palisades, and began the defensive policy of fortifications on all the frontiers which enabled him to hold the barbarians in check, though many able writers hold that to Hadrian's (117-138) pacific and defensive policy the ruin of the Roman Empire may be attributed. A merely defensive policy always ends in defeat. Men, and not fortresses or mountains or money are the defence of nations, hardy men, skilled men, patriotic men, men who prefer work with the brain to spectacular games. Yet Rome was hard to conquer even beyond the Alps. After Hadrian, Antoninus made a wonderful series of works about 145-150 A.D., called now the Teufel's Mauer, from Kelheim, West of Ratisbon, on the Danube, to Lorch, and then across the Neckar to the Maine near Hanau, and thence skirting the North of the Taunus range to the Rhine near Coblenz (Confluentes) and Andernach. By the way, I could spend an hour describing the battles which took place near Andernach alone.

It may interest my audience to learn that no small number of the legionaries who were stationed in the works of Antoninus were Britons from the territory where not many months ago I saw interesting traces of the great wall made by the same Emperor between the Clyde and the Forth, and witnessed military manœuvres in the vicinity.

The "Scourge of God" Attila with his army of Huns and other sword worshippers, started from his small village on the Danube somewhere near Vienna, led a mighty host across the Rhine near Mannheim into Gaul, carrying all before him till he reached that strategic decisive point of Orleans, which checked the English in 1429, and the Bavarians in 1870. It also foiled Attila who returned

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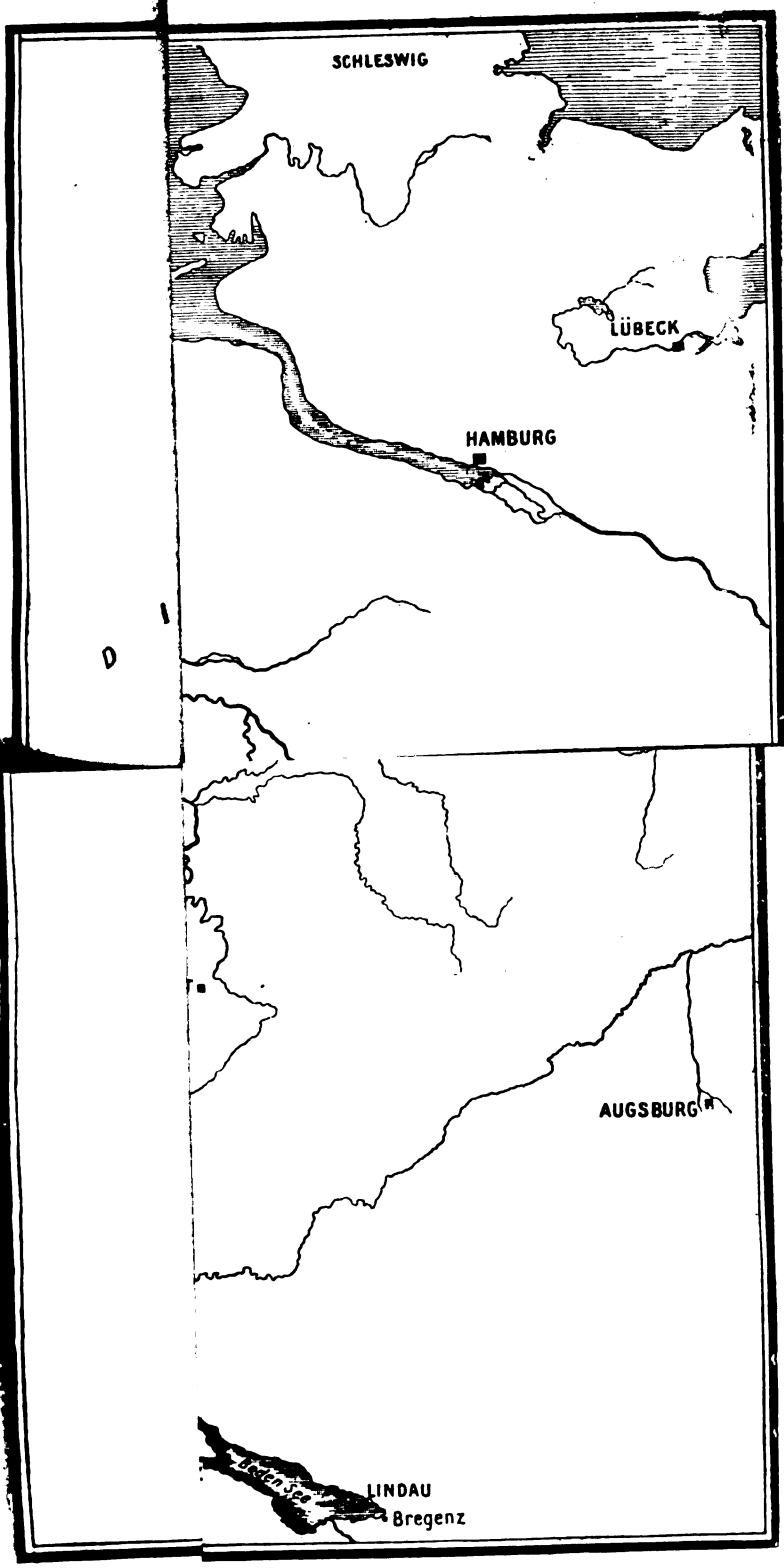
[To face page 492.



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to Châlons-sur-Marne, 451 A.D., where he was defeated by the Romans and Goths and retired again across the Rhine to the distant banks of the Middle Danube.

Essentials of the Roman frontier defences:—

What was essential to the system of defence was the chain of military posts; and so independent was this that even where a legion was established in the adjacent territory, its camp did not necessarily form part of the chain, but might lie at some distance towards the rear. Such was the case with York and Chester in Britain, with Mogontiacum (Maintz) behind the German lines, and with Lambaesis in Africa; in all which instances the legion that was stationed there, was connected by roads with the outlying posts, so that it was able to support them when necessary. The opposite plan, where the camp was included in the system of defence, is found on the lower Rhine and on the Danube. "A certain extent of territory, both within and without the line of defence, was appropriated by the defenders so that no barbarians were allowed to occupy it, a precautionary measure which was quite reasonable, since the position to be guarded was so exposed. It is not improbable that all the district between the German lines and the Upper Rhine, and also the region of Britain North of the Humber, and the southern portion of Numidia, were treated as marchland. A tendency soon arose for the soldiers of a certain legion to become the permanent occupants of a particular camp. Thus, the twentieth Legion is found at Chester, the sixth at York, and the third Augustan Legion in Africa. The outlying fortresses were garrisoned by auxiliary troops, and these could be more easily transferred from one station to another; yet the evidence goes to prove that they also frequently continued to occupy the same positions." See "Journal of Royal Historical Society," 1906-7.

Meanwhile, just as Attila was in full career, the southern Britons invited warriors from the swamps and bogs between the Elbe and the Ems and from the Frisian Islands—a district now again of vital commercial importance, and also of strategic importance—to help them against the northern Celts who were forcing their way South across the walls of Antoninus and Hadrian. The Romans had departed from Britain, and it took the Saxons and the adventurers from all the Baltic coasts who joined them, three hundred years to get the better of the British, whose strategy was helped by Roman roads and fortresses. The Saxon boats and cruises are described by Gibbon. If they could pass from behind the Frisian island screen then, could not their sailors and warriors pass over once again?

"The rumour of the successful armaments which sailed from the mouth of the Elbe, would soon provoke them to cross the narrow isthmus of Sleswig, and to launch their vessels on the great sea. The various troops of pirates and adventurers who fought under the same standard, were insensibly united in a permanent society, at first of rapine, and afterwards of government. A military confederation was gradually moulded into a national body, by the gentle operation

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of marriage and consanguinity; and the adjacent tribes who solicited the alliance accepted the name and laws of the Saxons. If the fact were not established by the most unquestionable evidence, we should appear to abuse the credulity of our readers, by the description of the vessels in which the Saxon pirates ventured to sport in the waters of the German Ocean, the British Channel, and the Bay of Biscay. The keel of their large bottomed boats was framed of light timber, but the sides and upper works consisted only of wicker, with a covering of strong hides. In the course of their slow and distant navigation they must always have been exposed to the danger and very frequently to the misfortune of shipwreck; and the naval annals of the Saxons were undoubtedly filled with the accounts of the losses which they sustained on the coasts of Britain and Gaul. But the daring spirit of the pirates dared the perils, both of the sea, and of the shore; their skill was confirmed by the habits of enterprise, the meanest of their mariners was alike capable of handling an oar, of rearing a sail, or of conducting a vessel; and the Saxons rejoiced in the appearance of a tempest which concealed their design, and dispersed the fleets of the enemy."

I do not dwell on the conquest of Gaul by the Frankish followers of Clovis, a small band 5,000 strong, who started on a pilgrimage of conquest from their bleak homes between the Meuse and the Rhine. Their success was complete, and Clothilde, the wife of the Frank chief, was probably more influential in his conversion than all the arguments of ecclesiastics. He was a successful leader who gave his followers lands and booty, and his tribesmen joyfully followed their leader to the baptismal font. But he soon had to face a tremendous attack on the Rhine by Alemanni, about the fiercest of the German race. The northern part of Helvetia had been subdued by the ferocious Alemanni, who destroyed with their hands the fruits of their conquest. A province, improved and adorned with the arts of Rome, was again reduced to a savage wilderness; and some vestage of the stately Vindonissa may still be discovered in the fertile and populous valley of the Aar. From the source of the Rhine, to its conflux with the Mein and the Moselle, the formidable swarms of the Alemanni commanded either side of the river, by the right of ancient possession, or recent victory. They had spread themselves into Gaul, over the modern provinces of Alsace and Lorraine, and their bold invasion of the kingdom of Cologne, summoned the Salic Prince to the defence of his Ripuarian allies. Clovis encountered the invaders of Gaul in the plain of Tolbiac, twenty-four miles from Cologne, A.D. 496.

The Franks, after an obstinate struggle gave way, and the Alemanni, raising a shout of victory, impetuously pressed their retreat. But the battle was restored by the valour, the conduct, and perhaps the piety of Clovis, and the event of the bloody day decided for ever the alternative of empire or servitude. The last King of the Alemanni was slain in the field, and his people were slaughtered and pursued, till they threw down their arms, and yielded to the mercy of the conqueror. Without discipline it was impossible for them to rally; they had contemptuously demolished the walls and fortifications

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which might have protected their distress, and they were followed into the heart of their forests by an enemy not less active or intrepid than themselves.

Influenced by Clothilde the Franks became Christians in the same year.

The Devil's Wall and mighty works of Rome on the Rhine bank had ceased to protect the Rhine frontier by the eighth century. Fortunately for Gaul and the Pope, successor of the Cæsars in Rome itself, a strong wise man born by the Rhine banks arose to save and unite for a period western Christendom, to deliver Italy from Gothic usurpers and to save southern Germany and Gaul from the domination of the Saxons. This terrible race of heathens, whose chief altar was in honour of Arminius, held sway from the Lower Rhine to the Elbe. They made an incursion into France, Charlemagne crossed the Rhine and broke their power, and converted them to christianity perforce. But this conquest was only accomplished after a war of thirty years, almost as savage and ruinous a war as that war of Thirty years, 1618-48, which for a long period almost suspended the animation of the Rhineland, sacked and ruined by fell warriors like Tilly, and occupied by the Swedish and Scotch soldiers of Gustavus Adolphus.

Charlemagne was made Emperor of the West by the Pope, 800. He added a second head to the eagle to show that the Roman and German Emperors were united.

As the Rhineland preserved the traditions of the municipal and military life of old Imperial Rome, the princes of the new and Holy Roman Empire had their first important marts and altars and senate houses on the Rhine, and when the Empire of the Carolingians fell into decay, the Emperors and the elected heirs, kings of the Romans, like Richard, Earl of Cornwall and son of King John were selected, enthroned, and in many cases buried by its banks. In 1256, Richard accepted the title and was crowned at Aix-la-Chapelle with his wife Sanchir 1257, and won golden opinions from the poor Germans by his prodigal gifts. Though he wisely returned to England in two years, yet he several times revisited Germany and exercised considerable influence.

The Church began to rear her head again; the faithful began to erect these magnificent Cathedrals, Abbeys, Doms and other edifices, monastic and regular, which excite the admiration of the traveller. Feudalism followed as an instrument for order when the raids of the Saxons and Northmen and Huns and Goths had exhausted themselves. But the towers of the barons and their retainers were almost as great a menace to commerce and civilisation as had been the incursions of barbarism. In no part of Europe was feudalism more firmly planted, nor were its drawbacks felt longer, than by the banks of the Rhine, in fact some of its worst features, such as the loan of its subjects as mercenary soldiers by the Princes to England, lingered till the close of the eighteenth century.

The castles of the robber barons are now so attractive that one almost thanks their old owners for their ferocious skill in selecting commanding "coigns of vantage" for their blackmailing operations.

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" In their baronial feuds and single fields,
What deeds of prowess unrecorded died!
And Love which lent a blazon to their shields,
With emblems well devised by amorous pride,
Through all the mail of iron hearts would glide,
But still their flame was fierceness, and drew on
Keen contest and destruction near allied
And many a tower for some fair mischief won,
Saw the discoloured Rhine beneath its ruin run."

The Rhine was by far the most important centre of commerce in Europe, and the avenue between Britain, most of France, Belgium, and great part of Germany and Italy. It was the via Saxonica of English pilgrims and traders to Rome, the city of the Soul of those days, and its merchants joined the mercantile Federation of the Baltic towns and German Sea, and became strong enough not only to beat down the barons, but also to fight Scandinavia and to win recognition from the Emperor.

The rise of the Dutch in the sixteenth century, their narrow commercial policy which led to great naval actions with the English in the times of Cromwell and Charles II; the closing the mouths of the Rhine, Meuse, Scheldt, between 1625 and 1815, and the general transference of trade to Atlantic ports after the discovery of the Americas; were fatal to the cities of the Rhineland. But their strategic importance continued and it is no exaggeration to say that millions of men passed on their career of slaughter backwards and forwards from the time of James I of England, till 1815. The thirty years war, 1618-48, was a terrible time, and scarcely less terrible were the splendid campaigns of Turenne and Montecuculi, but the climax of horror was the devastation of the Palatinate by Louis XIV.

" At this moment France was not strong enough to hold the conquests which she had made. Louis now hearkened to the diabolical councils of Louvois. From the Court of Versailles, the model of politeness, the centre of European refinement, issued a mandate which might have disgraced Attila or Zinghis Khan. The French Generals were ordered to burn the towns and villages they could not garrison, lest they should be occupied by the enemy. Heidelberg, the residence of the Elector Palatine, was one of the first places abandoned to the flames, and the ruins of the magnificent electoral palace still attest this act of ferocious barbarity. These orders were soon afterwards followed by others for a more wholesale destruction nothing less than the burning of all places near the Rhine between Mentz and Philipsburg. Spires, Worms, Oppenheim, Frankenthal, Bingen, and other places, with their beautiful Cathedrals and Churches and their ancient mediæval monuments, became a prey to the flames, and all that smiling region assumed the aspect of a desert. Altogether, more than forty towns and villages were burnt. A hundred thousand homeless human beings wandered about in search of some refuge for their misery, imprecating curses on the French and their cruel King, and demanding vengeance at the hands of the Empire and of Europe." See " Dyer's Modern Europe."

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I must hurry on, and merely refer to our own illustrious General Marlborough's celebrated strategic marches from Holland to Mayence, and thence to Blenheim on the Danube, and thence back to the Meuse and the Dyle, 1703-5. This in itself would be a striking proof of the importance of the Rhine valley. I pass over the wars of the Austrian Succession, Seven Years War, Berwick's Campaign, 1743, and the constant movements across the Rhine, 1793-97, and the wars of Napoleon. The British fought again and again in the Rhineland and Belgium and Holland, from the time of William III, till Waterloo. I shall only mention one deplorable incident, part of the retreat from Belgium through Holland over the Rhine and Bremen, 1793-95.

The French having crossed the Waal, the murmurs of the British induced their commanders to assume the offensive, and General David Dundas on the 30th December carried the French entrenchments at the village of Tuil at the point of the bayonet, and chased the enemy across the frozen Waal. But on the 3rd January, 1795, they recaptured Tuil from the troops of the Prince of Orange. Skirmishes occurred almost daily, and the weather grew still more inclement. A general advance of the French began, and there was no hope now of saving the Low Country from the masses of French troops who, in rags and miserably fed, were inspired with the enthusiasm of a political creed which had become almost a religion. After a repulse of the enemy by the Guards at Rhenen on the 14th January, Walmoden began a retreat beyond the Yssel, but the Government had resolved to embark the troops at Bremen, and the march was, therefore, continued over the bleak moorland to the Ems.

The retreat across that desolate region is as terrible as any in the annals of the British army. The Dutch population in the villages were very hostile, and any straggler from the main body was maltreated; the cold was so intense that brandy froze in bottles, a mantle of snow covered the country, and there was no shelter from the piercing winds on an almost desert plain. The ill-judged indulgence of the Government permitted the families of soldiers to accompany the regiments, and hundreds of women and children were frozen to death in the wagons, or, lying down on the plain, were covered with the drifting sand and snow.

It was not till the 24th February that any French forces appeared; on the 1st March there was another skirmish near Dollart; on the 4th the Ems was crossed, and the country was now in so swampy a condition from the thaw that the enemy gave up the pursuit. Falling back on Bremen, nearly all the survivors of the wasted battalions embarked on the 12th April, and reached England in safety.

The War of Liberation against Napoleon, 1813-14, surpassed all previous efforts of Eastern and Central Europe against France and Italy, both under the self-styled successor of Charlemagne. No Goth, no Hun, ever led such a numerous host as passed the Rhine at Düsseldorf, Cologne, Coblentz, Mayence, Basle, on the road to Paris, January to April, 1814. But even this enormous migration of the brain power and disciplined physique of Europe against France was surpassed in 1814. No fewer than 700,000 allies in first line, and

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300,000 in reserve moved on Paris from Brussels, Cologne, Mayence, Mannheim, and the Middle Rhine; all trained soldiers, British, Prussian, North and South Germans, Russians.

But in 1870-1 the Germans alone put 1,000,000 in France and took Paris. Look at the map of the modern frontiers of France and see how far the Germans have realised their "Watch by the Rhine"; not one acre of land by its banks is now under Gallic rule.

The Rhine of Commerce:—

So much for romance and poetry and strategy, but we must now pass from the Rhine of Moltke and Werther to the modern Rhineland, and its marvellous expansion of commercial industry in our generation. This is phenomenon beyond compare. The chimney of the factory and the smoke of the furnace now tower far above the Gothic shrine and the feudal castle and the Roman fortress.

French and British are in danger of being beaten, not only in regard to philosophy and war, but in regard to those very industrial arts and enterprises in which they fancied they had secured pre-eminence beyond all chance of rivalry. I beg you to reflect on the maps before you. Look particularly at Bremen, and Westphalia and the Rhine from Cologne to Düsseldorf, and study its statistics, and look at the industries of Frankfort and Barmen, and Eberfeld and Essen, and many other places. Consider the effect on Holland of the proposed canals. Try to ascertain the whole truth about Emden and Whilhelmshafen and the Frisian islands, and ask your civilian friends if our organisation, military, scientific, industrial, educational; if our aims, our cliques, our games, our spectacles, our plutocracy are in keeping with our Imperial responsibilities. Are you satisfied with our position and prospects? I trow not.

Well, I am not going to give any reports of my own. I have seen part of the Rhineland before it was overwhelmed with its hideous deformities of modern factory life, and I have seen parts of the same territory since. I admit that more has been done for the workman and his family to prevent their being degraded into mere adjuncts of machinery than is done here. But the prospect was not pleasing; I would prefer to be a follower of Attila or a Saxon oarsman or a Hessian mercenary, than to be a "factory hand." I see nothing good whatever to the future of humanity in this manufacturing maelstrom. The more furnace fires we light, the fewer sparks and particles of the Divine essence irradiate our souls. To me the immortal part of us is everything unless man is to be lower, not only than the angels, but lower than beasts. I do not believe that money is the sinews of war. I see no Pisgah view of the future of humanity in a mill. The hum of the wheels and the roar of dynamos have no relation to the harmony of the spheres. But if commerce, and chemistry, and production in factories, and steel trade, and coal trade, and textile industries, and leather industries be good for States, then if we do not awake and arise and shake our hitherto invincible locks, the commerce of the Rhine will soon defeat the commerce of Lancashire and of the Thames valley as totally as the Franks defeated the Alemanni. The distinguished French author and publicist

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M. Huret went to the manufacturing centres of the Lower Rhine and Westphalia to try to learn whether the German industries were surpassing the French. But to his amazement he also learnt that they were defeating the English, and *why*?

I will read, Sir, with your permission a few extracts and then conclude, having I fear utterly exhausted the patience of my audience without more than touching the fringe of my subject.

Military Training and Commercial Success:—

"A German Ambassador to whom I expressed my astonishment at the discipline that pervaded all ranks of the Nation, said in reply. "Without discipline, and indeed without military discipline, the admirable order which you describe as existing in even our smallest villages, and in all our public and private administrations could not exist. The German is by nature slow and heavy. If he be not managed by strict methods, he gets anchylosed and sluggish and goes to sleep. But above all without organisation and discipline, there could not be developed amongst us any national life, and there could be no real prosperity. You can see this for yourself in the records of our petty little princedoms."

The authorities given by M. Huret were men of affairs, and void of local prejudices, and quite ready to admit that other methods might suit better the genius of Britons or French, but they were discussing Germans. I may add that I heard similar remarks on the discipline and organisation of German Socialists by English Socialists returning from the late conference in Stuttgart. They assured us that the discipline of the German Socialists made the efforts of other European Socialists, especially the English, appear somewhat contemptible and futile.

The German Steel Industry:—

Herr Thyssen is one of the most powerful "Captains of Industry" in Germany. He employs 22,000 men, i.e. an Army Corps, and he treats them not in accordance with the despicable views of the Manchester School—that odious system of national and physical and moral degredation—as if they were " hands," but as human beings with hearts and souls, as well as hands. He has a port of his own, his works cover 7,000 acres, and he produces annually 1,700,000 tons of steel and cast iron. He told M. Huret that the German Steel Trust had not only faced, but defeated the competition of the powerful American Steel Trust.

The Industrial Rhineland:—

" Behold us in the centre of the wealthiest region of Germany, and the magnificent highway of the Rhine which is in itself an incomparable fortune, enriched also by the waters of its affluents, which give life to textile industry, collieries, steel works, dye works, and chemical products. Moreover, the country is full of mineral wealth. The coal of the Ruhr basin is estimated at 129 milliards of tons, a sufficient stock for some centuries to come. the country is

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also rich in its network of railways which radiate from Düsseldorf all over the land, literally like the threads of a spider's web. Public railways and private railways connect the mines with the factories, carry produce to the river and canal banks as a methodical and permanent tribute, and carry back in exchange produce from the ships coming from the sea with admirable facility, convenience and regularity. On a surface of 100 kilometres we counted 76 kilometres of railways. I have made many excursions in this breeding ground of Prussian wealth. It is within a radius of 40 kilometres that all this enormous richness is distributed. Cologne has 50,000 inhabitants, Düsseldorf 254,000, Essen 231,000, Eberfeld 162,000, Barmen 156,000, Crefeld 110,000, Dortmund 175,500, Bochum 118,000, Duisburg 192,000, Hagen 770,000, Mulhe-sur-la-Ruhr 93,600, Munchen-Galdbach 607,000, Oberhausen 52,000, Remscheid 64,000, Solingen 50,000. I stop, I do not discuss the innumerable villages depending on these towns, villages of 2-3-4-5000 inhabitants humming around the great industrial centres; a stupendous agglomeration which has not its equal in Europe, not even in Lancashire."

Might I ask my audience to take up any book of statistics, and contrast Lancashire in 1874, with this district in the same year, and then look at the strategic topography of both districts and of all north-west Germany and eastern England and to reflect. It would be well if both parties in the State were to weigh and to consider these amazing facts before making any more gushing and "patriotic" harangues. Playing to the gallery is deceiving the Nation. Let us be true men, especially as Truth doth not lie at the bottom of any well; its image and reflection can be studied in any Library, and indeed in any Atlas and Encyclopœdia.

We are a Sea Power, and Sea Cables are of the utmost consequence to our commerce and our Naval supremacy. In regard to electricity and the manufacture of land cables and over-sea cables and all German transmarine system, Germany only began to compete with England in 1890, and is now not only completely independent of our aid, but is a serious competitor in our markets.

In fifteen years this new German industry has distanced ours. One of the directors of the Submarine Cables factories said, "we are selling entire systems to England. The English have remained stationary, their guttapercha cables cannot sustain very high tension. We make fibre cables which are treated with impregnations and which can endure the most powerful currents. Hence this English industry is behind hand. The proof is that we have recently delivered cables to Glasgow, and that the works of "Guilloume de Leverkus a fourni tout le reseau de Londres."

Cologne more than rivals its former greatness under the Hanseatic League, when the high status of its merchants was recognised by our Plantagenets. Its port possesses a splendid electrical station, and a system of hydraulic force which gives a pressure of 90,000 kilogrammes. Its traffic is vast. Thirteen thousand ships are moored yearly at its two kilometres of quays. They come from Rotterdam, Antwerp, Amsterdam, Riga, Hamburg, Dantzig, Königsburg, and even from America direct. They are divided into sea-going vessels

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which are chartered direct to Cologne, river boats from Belgium and Holland, and boats coming from the interior, from Strasburg to the frontier of Holland.

"Germany presents us with this strange spectacle; the complete expansion of an ancient and poor people, on whom fortune has at last smiled. Surprised and delighted they fall to work, they press boldly forward on the roads of enterprise, they lead the way in the most frequented path of modern speculation and industry, and when work is over they get all the comfort and enjoyment possible out of their lives."

Here are ominous words which should come home to every man and woman in this room. "I had learned from books of statistics that the Germans having surpassed the French in all branches of manufacture were about to swallow up England (apres nous avoir distancés dans presque toutes les branches du commerce et de l'industrie était en train de manger l'Angleterre) Germany has gained economic mastery over Scandinavia and the Balkan States, and is now on a footing of equality with England in Italy and Spain, and is in the way of gaining commercial predominence in the East.

Already the English yearly lose influence in their own colonies, and are rivalled successfully in their own isle. Soon they will be beaten by the Germans in Canada, Australia, New Zealand, the Cape, and India."

Leather Industry:—

"After France, England for a long period held the second place in the market for coarse and fine Morocco and other leathern work. But to-day a client from London has spent 60,000 marks in purchasing valises, bags, portmanteaus, and purses."

Chemical Industries. Dyes:—

At Hoechst 190 chemists of high position work in splendidly equipped laboratories in search of new combinations, and its analysis for commercial purposes. Mainkur produces 3,000 different colouring products, among which are 300 kinds of black. "But" as a leading manufacturer said to M. Huret "England and France could easily have beaten Germany, as even to-day we Germans are tributaries to foreigners for 270,000,000 francs worth of materials."

"In chemical industries England is beaten by us Germans."

"If we reflect that Germany only started these industries thirty years ago, we stand amazed and perplexed before such a result. Thirty years ago England had no competitor in the market for salts of alkalis. And for the manufacture of colouring matters from the distillation of coal tar. It was far in advance of Germany."

"In fact it was at the period of the Crimea that the Englishman Perkins extracted Mauveine from coal tar, and Germany then possessed very few gas works, indeed it bought coal tar from its English neighbour. In 1886, it has 4,000 works, employing 78,000 workmen, at a total salary of 61,000,000 francs. In 1907, Germans are ahead of English, not only in the manufacture of colouring materials, but also in that of chemical and pharmaceutical materials."

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General Tylden, you have already allowed me Sir, to break through your rules of discipline by prolonging my lecture fifteen minutes after the hour. But I have enough definite and deliberate pronouncements of leading authorities to support my views that would take a week of lectures. Gentlemen should get and read Huret's "Rhin et Westphalie." But it is only one very clear and concise book out of many.

I need not urge patriotism and industry and desire for knowledge on this audience. They are all well educated and diligent, and students of chemistry, and of various other branches of science, and they have devoted their lives to our service for very small reward, not equal to the remuneration of pacific chemists by the banks of the Rhine.

But, Sir, we civilians are very dull, narrow minded and obstinate. We mistake snobbery for "good form," and party for patriotism, hence we lag behind our soldiers and various races of foreigners. Yet it is as much our duty as it is yours to maintain the credit of our race, in science, brain power, physical power in war, commerce, literature, art, indeed, in all the conditions of individual and collective progress. It is the duty of each of us men and women to do all we can for our Mother Country and for our neighbours and our children, otherwise the story of the ruin of nations by the banks of the Rhine and elsewhere, will be retold at the close of the twentieth century by some future Gibbon, and the decline and fall of our United Kingdom and its Empire will be added to the list of nations that fell because they would not learn the "moral of all human tales."

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Some Remarks concerning The Royal Artillery at the Battle of Talavera, July 27-28, 1809.

By MAJOR JOHN H. LESLIE, R.A., (Retired List).

THE map here given of the battle-field of Talavera de la Reyna in Spain, belonged to General Sir E. C. Whinyates, K.C.B., Royal Artillery, and was given to me by his nephew, Colonel F. A. Whinyates, R.A.

It is of especial interest to Artillerymen, because it was made by an Artillery Officer (Lieutenant William Unger, who belonged to the Artillery of the King's German Legion, and who himself took part in the battle), and shows the exact position of all the British guns.

Table showing the Companies of Royal Artillery (attached to brigades of guns) which were present at the battle of Talavera.

Battalion.	Commanded by	Armament.	Designation in 1908.
1st.	2nd Captain Henry Baynes.	Light 6 Prs.	2nd Battery, R.F.A.
7th.	Captain Charles Doyne Sillery.	Light 6 Prs.	18th Battery, R.F.A.
8th.	Captain Robert Lawson.	3 Prs.	87th Battery, R.F.A.

Sillery, Lawson, and Baynes, received the small gold medal for Talavera, awarded to Officers commanding units.

Two companies of Artillery of the King's German Legion were present under the command of Captain W. L. Heise, and 2nd Captain C. von Rettberg, both of whom received the gold medal. These brigades were armed with light and heavy 6 prs., respectively.

The King's German Legion was a force composed of all arms (Cavalry, Artillery, Engineers, and Infantry,) and was a regular component part of the British army at that time—formed in England in 1803. It was officered by German Officers and chiefly composed of volunteers from the lately disbanded Hanoverian Army. The Legion was disbanded in 1815-16.

As Unger's writing on the map is not very distinct, I have thought it best to *print* the names, letters, &c. The map, as reproduced, is the same size as the original. The scale is about 1 : 15,000.

The following account of the battle is in Unger's writing on the body of the map.

Battle of Talavera. July 28, 1809.

The French crossed the Alberche on the 27 at about 3 oclock in the afternoon. The whole of the Spanish army was already retreated and in their position when General MacKenzie was surprised in a wood along the Alberche & retired.

At 5 o'clock the enemy attacked the right of the Spaniards and

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our left with much violence, took the hill x which was two times taken and retaken and at last retaken and maintained by General Hill's Division and Battalion, K.G.L.

In the morning at day light the enemy attacked our left again in order to gain the hill but was repulsed. The Heavy Artillery 6 Prs. was then sent from the right of the 4th Division to the left of the K.G.L.

A cannonade from both sides continued till about 12 oclock when a complete armistice took place for 2 hours.

At 2 oclock a very heavy cannonade began. The Guards were attacked by a Division. The Heavy Brigade 6 Prs. was then ordered to the right of the K.G.L. to assist the Guards and in half an hours time the French retired in disorder after the Guards had charged them with the bayonet.

In the mean while a Division of about 15,000 French attempted to attack the hill again but was stopped by our Cavalry, the 23rd Light Dragoons and 1st Hussars, K.G.L., charging their columns, which attack, however, did not succeed. A ditch, the steadiness of the enemies columns, & the fire of their artillery prevented the succeeding of the charge. At about 5½ or 6 oclock General Sebastiani with 15,000 infantry and cavalry advanced till about 200 yards before our centre, when the whole charged them. The 78th regiment which was in the rear came up in assisting of the 7th battalion, K.G.L., and short after the French were repulsed. No further attack took place since. The cannonade continued till dark.

At day light the French retired, leaving the wounded and 2 brigades of artillery in our hands.

A division of about 20,000 French troops, under the command of King Joseph did not take part of the enemy's attacks, but kept the Spaniards (by a distance of about 2500 yards) in tranquillity.

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a.	Brigade heavy 6 Prs.	Captain W. L. Heise, Artillery, K.G.L.
b.	Brigade light 6 Prs.	2nd Captain W .G. Eliot, R.A.
c.	Brigade light 6 Prs.	Captain C. D. Sillery, R.A.
d.	Brigade light 6 Prs.	2nd Captain C. von Rettberg, Artillery, K.G. Legion, and 4 Spanish guns and howitzers.
e.	Brigade light 3 Prs.	Captain R. Lawson, R.A.
f.	Reserve ammunition.	

(sd). W. Unger, Lt.,
German Artillery.

It will be noticed that in the above key list to the positions of the various brigades of artillery on the map, "b" is shown as the brigade of " 2nd Captain W. G. Eliot." This was the brigade to which May's company, of the 1st battalion, was attached. Incidentally the question arises as to who actually commanded this brigade in the battle.

This company, now represented by 2nd Battery, Royal Field Artillery, landed at Lisbon on March 6, 1809, under the command of Captain J. May. May, however, soon left it, and for the entire

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duration of the war was employed on the R.A. staff, and never rejoined. The command naturally devolved upon the 2nd Captain, Henry Baynes, and from the information contained in Battery Records, it has always been understood that Baynes was in command at the battle of Talavera.

But, in Professor Oman's " History of the Peninsular War," Vol. II., page 512, the following paragraph—foot-note—occurs, referring to the disposition of the artillery at the battle:—

" These details I give from the valuable (unpublished) map by " Lieut. Unger of the K.G.L. Artillery, which Colonel Whinyates " has been good enough to place at my disposition."

" It carefully marks the emplacement of every British Battery.[1] " Eliot was at this moment in command of the battery which had " been under Baynes during the Oporto campaign."

On page 655 of the same volume, a list is given of the brigades, R.A., present at Talavera, of which Captain J. May's company, of the 1st battalion, "under 2nd Captain W. G. Eliot" is one.

The names of five Captains are given on Unger's map as commanding brigades of guns in the battle—R. Lawson, C. D. Sillery, W. G. Eliot, Royal Artillery, W. L. Heise, and C. von Rettberg, King's German Legion Artillery.

To each of these, Eliot excepted, was awarded the Gold medal for Talavera, *and to Baynes as well*, and there is amongst the Dickson MSS. a letter from Baynes on this very subject, dated Woolwich, November 16, 1813, submitting his claim to the Gold medal for Talavera, in which the following passage occurs:—

" The brigade I then [i.e. at the battle of Talavera. J.H.L.] " commanded was attached to the 3rd division, forming the advance " of the army, and was engaged with it on the day preceding the " general action, and in the latter it was of course also warmly en- " gaged; during this I was with it, until obliged to be taken from the " field on the 28th, in consequence of a wound."

Eliot at this time belonged to Captain J. P. St. Clair's company, of the 5th battalion, stationed at Chatham, and in the company muster rolls for July, August, and September, 1809, he is shown as "on com- " mand" at Lisbon.

He was certainly present at the battle of Talavera because he received the silver " General Service medal, 1793-1814," with clasp for Talavera, which was granted in 1847, and this fact is in itself, I think, the best proof that he *did not command a brigade*, for if he had done so he would have been entitled to the Gold medal.

Eliot may possibly have taken up the command of Baynes's brigade when the latter was wounded, and it is not unreasonable to suppose that when Unger was collecting materials for his map he put down the names of Officers who were actually on the spot at that particular moment.

In 1811 Eliot published "A treatise on the Defence of Portugal,"

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[1] Note by Professor Oman. "The word '*battery*' is technically an anachronism. The unit which "in 1908 is called a '*battery*' was in 1809 styled a '*brigade of guns*.' But I found that in mixed narra- "tive of battle, where artillery was not the only subject in question, the use of the terms '*brigade*' "and '*troop*' cause hopeless confusion—and that not only to civilian readers."

"To an audience of Gunners the words '*brigade*' and '*troop*' are all right, but with any other audi- "ence they often lead to misconceptions."

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in which the greater part of one chapter is devoted to a description of the battle of Talavera, but no mention is made of himself as having commanded a brigade of Artillery.

I referred this question to the late Colonel Whinyates, and he entirely agreed with the view expressed above, viz. that Baynes, *not* Eliot, was in command, holding the opinion that the extract from Baynes's letter settled the point without the possibility of doubt, and he was especially desirous that the mistake should be corrected in any future edition of Professor Oman's History of the War.

I also referred the matter to Professor Oman who writes—May 25, 1907—" If I had seen Captain Baynes's letter of 1813, I should " (like Colonel Whinyates) have abandoned Unger's theory that " Eliot was in command."

Mention may be made here of a quaint incident at the battle of Talavera in which Captain Sillery played the chief part.

It is related by the late General Sir E. C. Whinyates in some " Notes on the War Services " of Sillery's company "from January " 1809 to April 1813,"[1] which were compiled by him "when command- "ing the 7th battalion at Woolwich, about the year 1832." The details were obtained from private letters of Bt. Major H. B. Lane, R.A., who during the period referred to—1809-13—was 2nd Captain of Sillery's company. The story is as follows:—

" There is an anecdote of Captain Sillery on this occasion which " shows so much proper military feeling that it ought not to be omit- " ted,although it is difficult from the nature of the subject to introduce. " On the day of the battle of Talavera, Captain Sillery was labouring " under diarrhœa, and, unfortunately, at a time that his brigade was " most hotly engaged he was violently attacked by the complaint. " Turning to an Officer near him, he said, ' I shall not go to the rear, " it may be said I was afraid.' He then deliberately walked a hundred " yards in front of the brigade, and disembarrassing himself of part of " his clothes, yielded to the irresistible necessity of the case; after " readjusting his dress, and calmly putting on his sword and sash, " he returned leisurely to his post. The transaction excited a good " deal of mirth, notwithstanding the heat of the action, and a gunner " exclaimed, ' by my soul, our Captain is a sound and a staunch one.' " There could not be a better moral to the anecdote."

" Not long after, the brigade had the ill fortune to lose its brave " Commanding Officer. Captain Sillery died on the 30th of Septem- " ber, 1809, when encamped under the walls of Badajoz."

It has been stated above that the Gold medal for Talavera was awarded to Sillery. This is not, however, strictly accurate, because the medal was not actually awarded until July 1, 1815, nearly six years after his death. The following extract from a letter dated, " Horse Guards. July 1, 1815 " addressed to Mrs Sillery, fully explains the matter.

" Madam, The Prince Regent having been graciously pleased to " command, in the name and on behalf of His Majesty, that the " Officers present at the battle of Talavera should be permitted to

1 See "Proceedings, R.A. Institution," Vol. XIV., in "Notes by various hands," issued with the September number of 1886.

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" bear a medal commemorative of that brilliant victory, I have to " transmit to you the medal which would have been conferred upon " the late Captain Sillery and which the Prince Regent has been " pleased to direct should be deposited with his family as a token of " the respect which His Royal Highness entertains for the memory " of that Officer."

(sd). " Frederick, Commander in Chief."

Sillery was appointed to the Royal Artillery as a 2nd Lieutenant on September 8, 1794, without having been at the Royal Military Academy as a cadet. He was promoted to the rank of Capt.-Lieutenant on September 1, 1798, and to that of Captain on October 13, 1804.

The portrait here given is copied from a miniature, the property of Major C. C. A. Sillery, Indian Army, a member of the family, who has most kindly allowed it to be reproduced.

Captain Charles Doyne Sillery, Royal Artillery.

Major Sillery also possesses his ancestor's Talavera gold medal, and the original letter addressed to Mrs Sillery regarding its presentation, and he has furnished the following information concerning the ancestry of C.D.S.

" Charles Doyne Sillery was descended from a French Huguenot " family long domiciled in the county of Meath, Ireland, and was a " son of Anthony Sillery."

" The latter appears to have been of some local civic importance, " as both he and his father—also named Charles Doyne—were at " different times sheriffs of the then important town of Drogheda, " and Anthony was Mayor in 1797."

Captain Sillery's son—also a Charles Doyne Sillery—published in 1834 a volume of poems, entitled " The Royal Mariner."

One of the poems is called " My Father. The Field of Talavera," and judging from it, one is forced to the conclusion that the poet

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must have thought that his father died as the result of wounds received in that battle. Four of its eight verses are here given:—

" All mournfully,—yet calm and mild,
" I saw a warrior—self exiled—
" Kneel by the cradle of his child;
" Near the field of Talavera."

* * * * *

" See where the crimson torrent streams;
" See where the steel-clad harvest beams;
" See where the red artillery gleams,
" On the field of Talavera."

* * * * *

" The dreadful work of death is done;
" A widowed wife, a sireless son,
" Are left to weep a battle won,
" On the field of Talavera."

" Victorious Peace herself may mourn
" That he shall never more return:
" Oh! dig his grave, and raise his urn,[1]
" On the field of Talavera."

As a prefatory Note to this poem is given the letter above quoted from the Commander in Chief (July 1, 1815) notifying to Mrs Sillery the award of the Talavera Medal, and the following extract from a letter of Brig. General E. Howorth, R.A., dated from Badajoz, October 4, 1809:—

" Captain Charles Doyne Sillery died on Saturday, about half " past two in the morning, on the 30th of September, after having " distinguished himself in a very particular manner, in both the ac- " tions of 27th and 28th of July, at Talavera, where he behaved with " conspicuous gallantry. He was much beloved and respected by " his brother Officers, and his loss deeply lamented."

The idea which the poet formed and embodied in verse appears, like " the red artillery," to be quite fanciful, and not in any way bone out by recorded facts.

In the official returns of Officers killed, wounded, and missing, the following Royal Artillery casualties are given:—

Killed.	Lieutenant H. Wyatt (May's company).
Wounded.	Lieut. Colonel H. Framingham. 2nd Captain H. Baynes (May's company). 2nd Captain J. Taylor (Lawson's company).

Taylor was left in hospital at Talavera after the battle, and fell into the hands of the French. He is frequently mentioned in a book entitled " A Prisoner of France," by Captain Charles Boothby, R.E., (London: Adam and Charles Black. 1898), who also was wounded at Talavera. Boothby's leg was amputated, and with Taylor he was taken prisoner by the French.

[1] Foot-note by the poet. "My Father's remains were deposited in the cathedral of Badajoz in "Spain."

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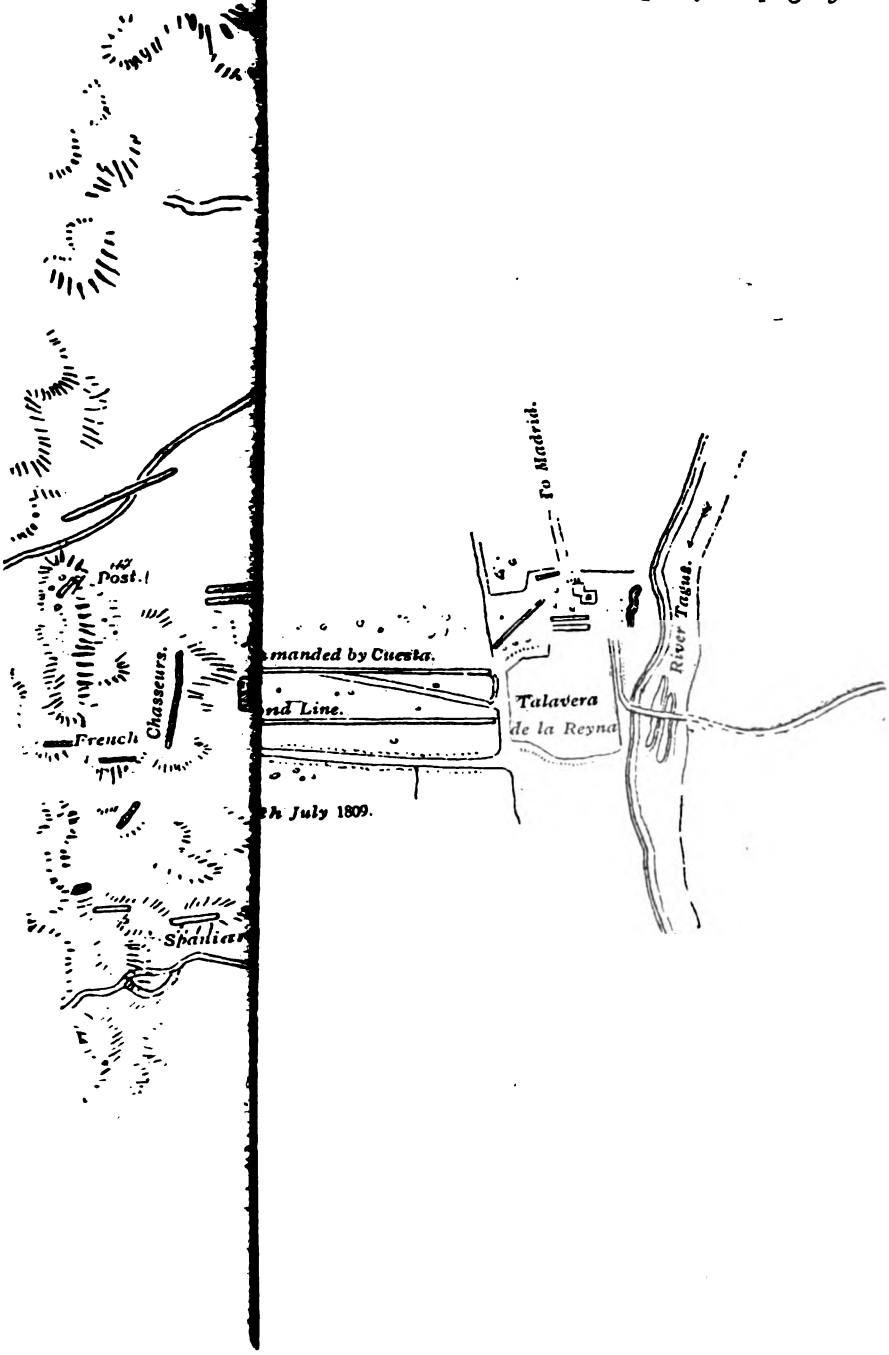
[*To face page 508.*



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SWIMMING HORSES.

By COLONEL E. J. PHIPPS-HORNBY, V.C., R.H.A.

DURING the past summer the 1st Cavalry brigade, including three batteries of horse artillery, has been practised at Aldershot in swimming the horses across a river by a novel method devised by Brig. General the Hon. J. Byng. It is so simple, and proved so successful, that no doubt my brother officers will be glad to learn something about it, and, I hope, will practise it with their own batteries.

As most people know, the old method of swimming horses across a river always exposed both men and horses to some risk of drowning. Horses were either (1) led over by men in a boat, (2) driven into the water and left to their own devices to reach the further bank, or (3) were pilotted across by a man swimming with each horse or sitting on the horse's back.

But it is evident that (1) was very slow; (2) was unsatisfactory, as all control over the horses was lost, and they could land where they pleased, sometimes on one bank, sometimes on the other, or if so minded, they could swim down the middle of the river; (3) was always a dangerous operation, and even with men who were expert swimmers, the control they exercised over the horses was very limited.

In instructing us in his method, General Byng was careful to impress upon us that his method was meant only for taking small bodies of cavalry across a river when not hampered by a large amount of transport. In the latter case it would probably be better to build some sort of bridge.

To state it briefly, General Byng's scheme is to have an endless 2″ rope, anything bigger sinks too much and has to be so strained that it breaks, running through four snatch blocks, two on each bank, three of these are made fast to holdfasts, the fourth is fixed on to a tackle which in turn is fixed on to a holdfast, the object of this being that should the rope stretch, it can be adjusted, without slacking the rope, to the necessary amount of tautness,—it should be tightened whenever it sinks into the water at all. He claims for his system that, (1) there is absolutely no risk to human life, though occasionally through carelessness a horse may be drowned, (2) that the horses are compelled to land at the point at which it is wished to land them, and (3) that the system is very much quicker than any other.

The following is a detailed account of the method. All the stores required to carry it out were provided by the 1st Field Troop, R.E. Each of the cavalry regiments and of the Horse Artillery batteries was practised on three separate days at the cavalry swimming pond just below Hungry Hill. The pond varies in width from 150 yards to 100 yards, and across this two endless ropes were fixed, each in the shape of an irregular oblong. The holdfasts on each bank should be placed about thirty yards from the bank, and the distance

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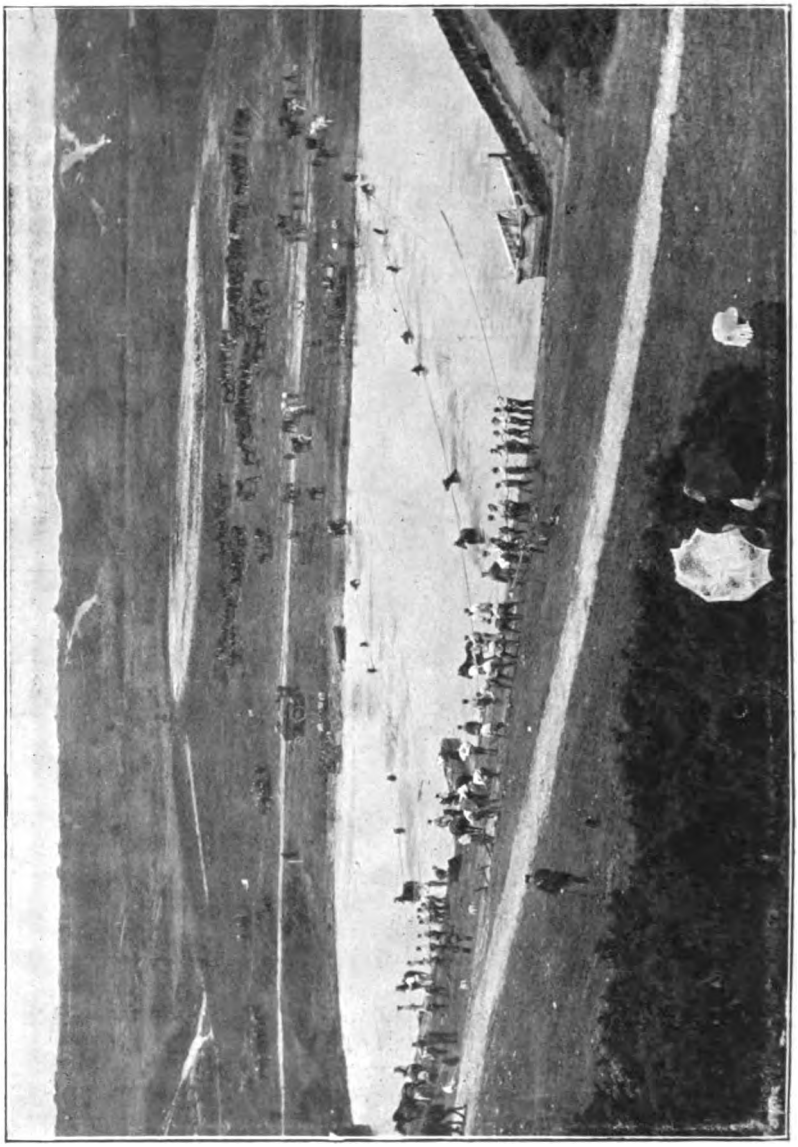
along the bank between them should be about forty yards. The rope should be so adjusted that it is about eighteen inches above the water, it must not be too tight or the effort to pull it fast enough is too great.



[Photo by Mr. John Chew, Aldershot. Copyright].

Now we will consider that a unit has reached the piece of water which it is desired to cross and that the endless rope has been fixed up as explained above. Of course some sort of boat or raft is necessary. The horses are unsaddled, and only a head collar and a good head rope is left on each. The saddles, bridles, and mens' kits of a

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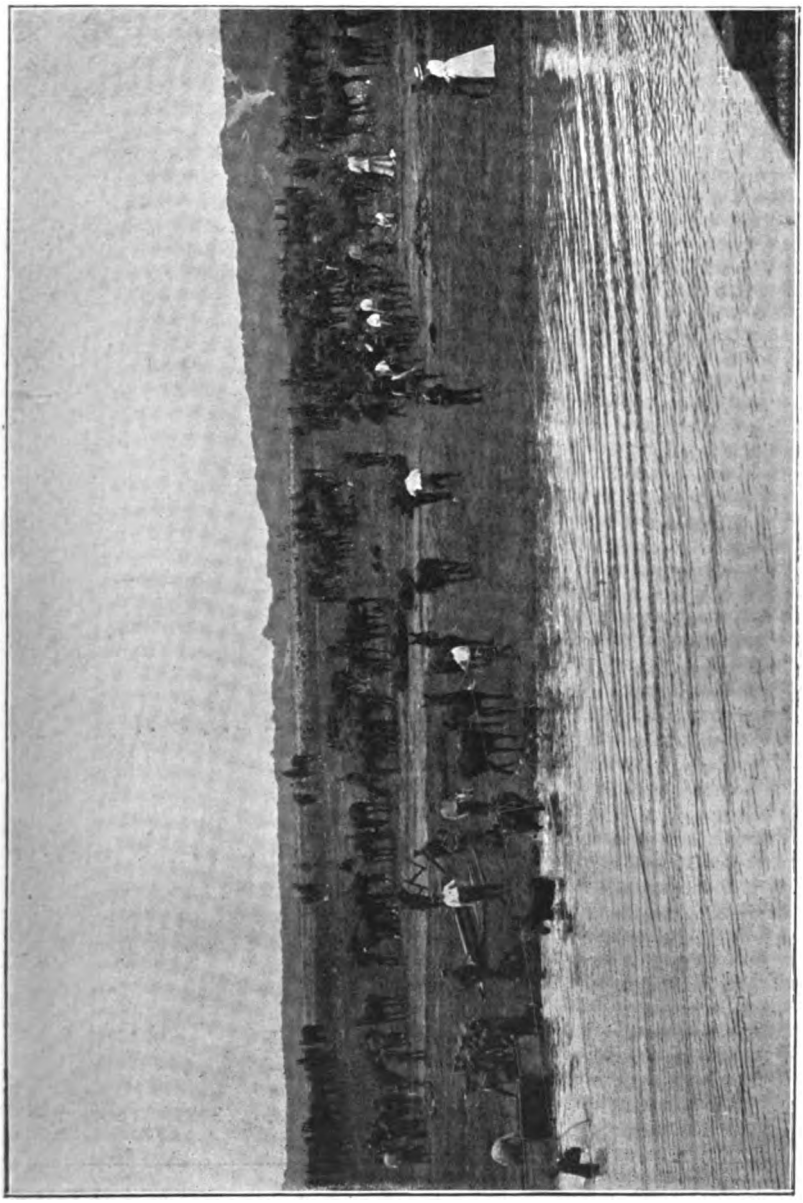
squadron are sent over with as many men as can be spared. On arrival at the opposite bank these men are divided into three bodies, (1) those to pull on the endless rope, (2) those to receive the horses



[Photo by Mr. John Chew, Aldershot. Copyright].

and cast off the head rope from the endless rope, (3) those to collect the horses and hold them till all are across. It is most important that the men pulling the endless rope should do so hand over hand, and as quickly as they possibly can, for they will find that the horses

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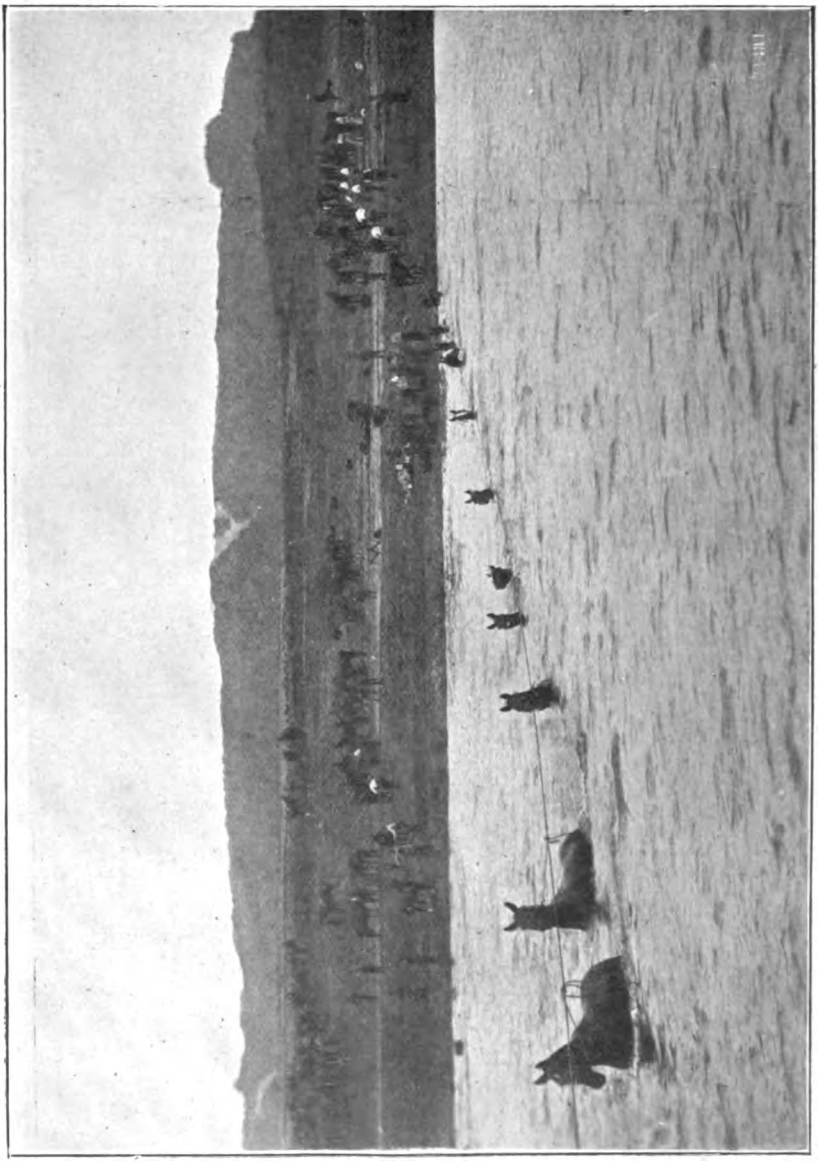
will always begin by swimming faster than they can pull, and this will often result in the horses being upset backwards and possibly in their being drowned The men receiving the horses must each



[Photo by Mr. John Chew, Aldershot. Copyright].

have a clasp knife open and ready to cut the head rope should the knot be too securely tied.

On the starting off side, each horse must be led to the holdfast where it is handed over to a lasher, of whom there should be about four specially trained men. On the manner in which these men do.

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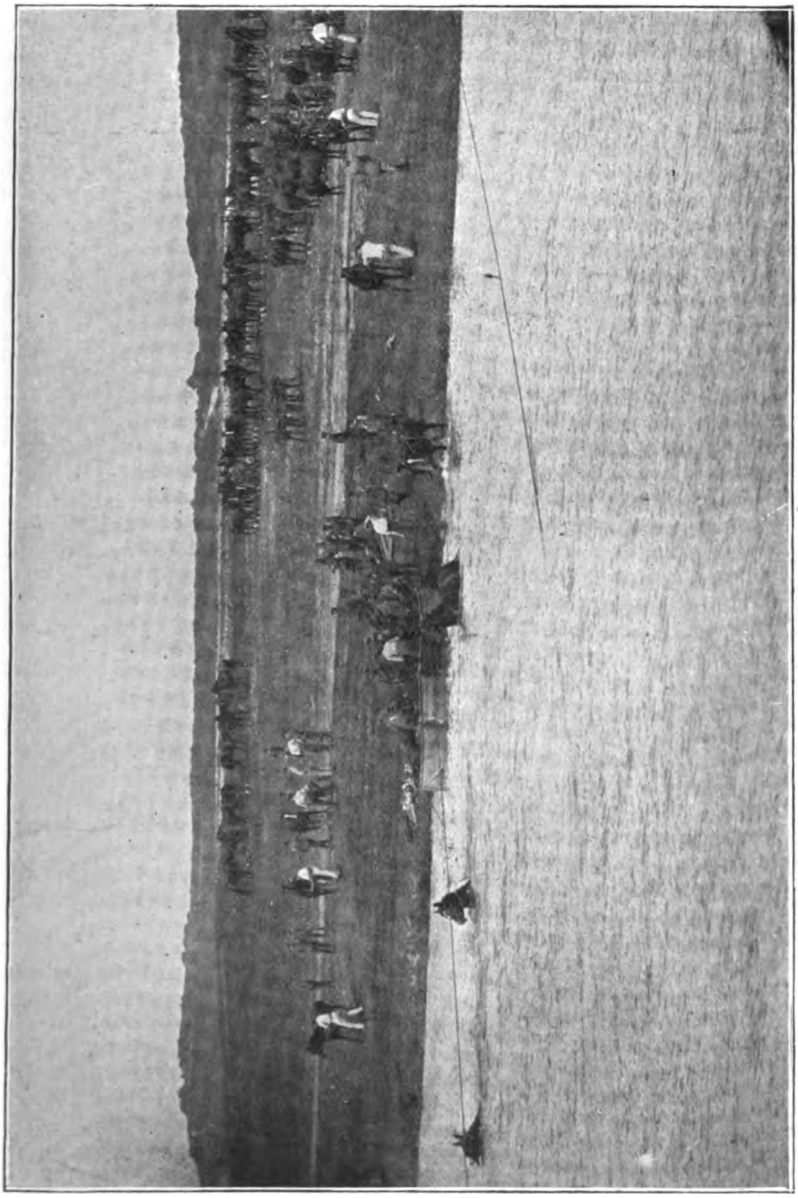
their work depends the rapidity and success of the passage. Each lasher, walking backwards towards the bank, ties the head rope on to the endless rope with a double clove hitch and slip knot, so that



[Photo by Mr. John Chew, Aldershot. Copyright].

the receiver can easily, by pulling on the end of the head rope free it from the endless rope. The distance from the horse's head to the endless rope must not be more than eighteen inches. The horses are tied on at intervals of about two horses lengths, and care must

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be taken that the head rope is tight round the endless rope, as otherwise, should a horse not like to go into the water, he will get back against the next one following him, these two may then damage one another while swimming, and there may be difficulty in untying the knots on the landing side. It is most important that the endless rope should be kept moving the whole time, for it must be remembered that there are generally about twelve to fifteen horses in the water at the same time, all tied to a rope, and that they will continue swimming whether the rope is moving or not, consequently, if the rope remains stationary they will upset themselves and probably be drowned. On the landing side there should be four receivers with open clasp knives, six men ready to take the horses as soon as they are untied off the rope, and from twenty to thirty men to pull on the endless rope. Thus should a receiver find a knot jammed, he will instantly cut the head rope before it reaches the first block on the landing side. The time taken in getting 125 horses across the cavalry swimming pond on two endless ropes was about eight minutes.

All the cavalry regiments and Horse Artillery batteries had done their three days practice by the end of July, and on August 1st, General Byng ordered the three cavalry regiments, and two guns and two wagons with as many mounted men as possible from each battery, to parade at 7.45 p.m. At that hour we were informed that we were supposed to be going to make a raid N. of the Thames, crossing that river above Windsor, where the bridge was supposed to have been destroyed. We marched *via* Ascot, and arrived at 2.15 a.m. August 2nd at the Windsor race course. There the Engineers had put up a number of endless ropes and a landing stage from which to embark the vehicles on one bank and another on the other bank to disembark them. The R.H.A. proceeded at once to pass their guns and wagons across, and just as it was getting daylight the cavalry regiments began swimming their horses across, then the Horse Artillery horses were swum across. A small bridge had to be made across a dyke on the Eton side to pass the guns, &c., on to the road, this caused a little delay, but the whole passage of the river only occupied two and a half hours. The vehicles took one and a half hours, the horses had been waiting on the landing side some time before the vehicles were across. We then marched through Eton and Windsor and Windsor Park to Ascot where we arrived and breakfasted at 8.15 a.m. We remained there until 10.30 a.m. and were back in our barracks by 1.15 p.m., having covered close on fifty miles and made the passage of the Thames at Athens, in 17¼ hours without doing any damage and without any accident to horse or man. I think this proves General Byng's method of swimming horses to be infinitely superior to any other. Of it Sir John French says in his remarks on the training of the Aldershot command, "The swimming of the Thames by night by the whole brigade (cavalry) in a wonderfully short space of time was an almost unique performance."

I enclose four photographs taken by Mr. John Chew of Aldershot, who has very kindly allowed me to publish them. They are copyrighted, but they may give a better idea of the arrangements than my description does.

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Battery Drills and Ranging Exercises with Puffs.

BY CAPTAIN M. H. C. BIRD, R.G.A.

IT appears to be assumed that when using puffs to indicate the position of shell-bursts it is necessary to fire them in accordance with a pre-arranged scheme; by so doing, the B.C. is deprived of all practice except that obtained by working out the scheme beforehand. This can be remedied by firing the puffs in accordance with the corrections given by the B.C. There is no difficulty in doing so, as communication always has to be established between the range party and the battery in any case.

The range officer (or N.C.O.) should be told what the range is, and should be allowed to fix on a reasonable "error of the day," say up to 10% of the range, an amount which is not likely to be exceeded, but which, I believe, may occasionally be met with on the Continent in summer. Suppose the actual range to be 5,600 and error of the day − 100, a round fired at 5,400 would be answered by a puff at 5,300, or 300 short, a round fired at 5,700 would be answered by a puff at 5,600, or "range," and so on. To facilitate matters, pegs should be put out in the line of fire at intervals of 25 yards for guns, and numbered, and then, on the range being ordered by B.C., it is signalled to the range party who get ready a puff at the proper peg, when the gun is fired "F" is sent, and after the time of flight has elapsed the puff is fired.

In the case of howitzers the pegs should be put out at an interval equal to the probable error at the range, the "range" peg being marked with the elevation corresponding to the range + or − the error of day. This corresponds to the instructions for ranging on p. 133 "Garrison Artillery Training," Vol. II. The range officer should have a table or simple diagram shewing the pegs corresponding to the different elevations.

From this it is but a very short step to a very realistic procedure which consists in not firing the puffs at the actual point corresponding to the correction given, but at a point determined in accordance with the laws of probability. For the sake of simplicity it may be assumed that the variation in the fall of shot will always be a multiple of the probable variation, that is to say, rounds may be taken to fall either at the point aimed at, or at a distance from it equal to once, twice, three or four times the probable variation. Out of 100 rounds the numbers may be taken approximately as "range" −26, +1 (times prob. var.) −21, −1 ...21, +2 ... 11, −2 ... 11, +3 ... 4, −3 ... 4,

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+4 ... 1, −4 ... 1. The range officer is supplied with a bag containing 100 counters of sorts, of which 26 are marked 0, 21 are +1, 21 −1, 11 +2, 11 −2, 4 +3, 4 −3, 1 +4, 1 −4. When an elevation is sent in, the range officer first determines the peg corresponding to it, then draws a number from the bag and increases or shortens the range by the number of pegs on the counter. 20 pegs would usually suffice, and they should for convenience be numbered from 1 to 20, 10 being at "range" and 1 nearest the battery. In putting out the pegs the most convenient way is to plant No. 10 first, as is done for siege practice. In the case of guns, when the range + or − the error of day does not come to a number that can be set on the sights, No. 10 peg is planted at the nearest 25 in front of or behind the "range" point.

If the ground slopes considerably at the target this should be allowed for in putting out the pegs, and if there is much irregularity as in the case of a target battery or fort it is simplest to draw a section of it on squared paper, draw a horizontal line through the ranging point, mark off on it the positions of the pegs, draw lines through these points at an angle with the horizontal equal to the angle of arrival, and plant the pegs at the points where these lines cut the section.

If it is desired to introduce variations in shooting between individual guns it can easily be done by signalling the number of the gun to be fired to the range party, the range officer can then give a permanent gun error to one or more of the guns for any series.

In the following examples, the numbers in column 4 were actually drawn.

EXAMPLES. SERIES NO. 1.

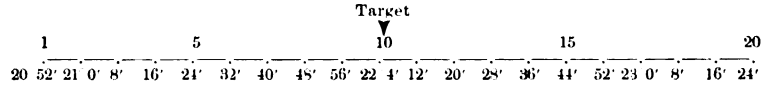
6" B.L. Howitzer, Mk. I. Full charge. Projectile 100 lb. (Range Table provisional 1905).

Actual range 5,200. Error of day −150. Corrected range 5,350.

Elevation for 5,350, 22° 4′.

50% Zone at 5,200 = 44·7 yds. Probable var. 22·35 yds = 67 feet corresponding to 8′ mins. difference in elevation.

Pegs planted at 22⅓ yards interval.



Round.	Elevation.	Peg.	Variation drawn.	Puff at Peg	Result at yds.	
1	21° 10′	3	+2	5	−111⅔	
2	22° 30′	13	0	13	+ 67	
3	21° 50′	8	0	8	− 44⅔	
4	22° 10′	11	0	11	+ 22⅓	short bracket 20′
5	22° 0′	9½*	0	9½	− 11⅓	
6	22° 0′	9½	0	9½	− 11⅓	
7	22° 0′	9½	0	9½	− 11⅓	
8	22° 10′	11	+2	13	+ 67	
9	22° 10′	11	0	11	+ 22⅓	

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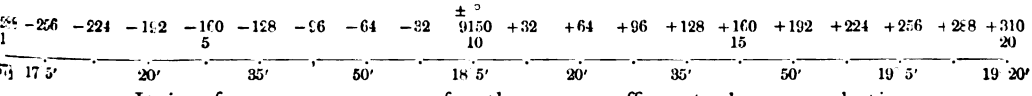
10	22°	10′	11	−2	9	− 22⅓
11	22°	10′	11	+1	12	+ 44⅔
12	22°	5′	10	+1	11	+ 22⅓
13	22°	5′	10	+3	13	+ 67
14	22°	5′	10	0	10	+ 0
15	22°	5′	10	+1	11	+ 22⅓
16	22°	5′	10	+1	11	+ 22⅓
17	22°	5′	10	−1	9	− 22⅓
18	22°	5′	10	−1	9	− 22⅓
19	22°	5′	10	−4	6	− 89⅓
20	22°	5′	10	+2	12	+ 44⅔
21			10	−1	9	− 22⅓
22			10	−3	7	− 67
23			10	0	10	± 0

The above is a specimen of the form that should be kept by range officer, and handed in afterwards as a check on the observation.

EXAMPLE II. (XVI. IN G.A.T., VOL. II.).

Round.	Elevation.	Peg.	Variation Drawn.	Puff peg.	Result.
1	16° 30′	—	+4	2	−256
	17° 30′	5⅓*	0	5⅓*	−150*
	17° 30′	5⅓	+1	6⅓	−118
	18° 30′	13⅓	+1	14⅓	+138
	17° 50′	8	−4	4	−192
	18° 10′	10⅔	0	10⅔	+ 20
	18°	9⅓	−3	6⅓	−118
	18°	9⅓	−1	8⅓	− 54
	18° 5′	10	−1	9	− 32
	18° 5′	10	−2	8	− 64
	18° 5′	10	0	10	± 0

50% zone 9,150 yds. (18° 5′) 64 yds. Prob. var. 32. Pegs at 32 yds. interval corresponding to 7½ mins. (10′ = 44 yds.).



It is of course necessary for the range officer to know each time what means of giving elevation and, in case of howitzers, what charge is to be used.

This system appears to be the one followed in the Austrian Siege Artillery, and is fully described in "Mitteilungen über Gegenstände des Artillerie- und Geniewesens," No. 4, 1906. One great advantage is that the whole of the battery drill, training of B.C., observers, &c., can be gone through without taking the guns out, which enables one to use land that would otherwise not be at one's disposal. I have, therefore, thought is desirable to bring the matter to the notice of the Regiment at large. The saving of ammunition must be considerable, as ranging can be taught properly with puffs by this means.

* Half-way between 9 and 10.
* Fired 10 yds. nearer target than peg 5.

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A System of Messing suitable for a Brigade of Artillery.

By CAPTAIN C. C. ROBERTSON, R.F.A.

THE following system of messing has been tried and found satisfactory. The principle observed is that the control of the messing should be in the hands of the battery commanders, and that due advantage be taken of the expert knowledge of the master cook.

Battery commanders deal directly with the master cook, in order to get full value of his training and experience.

Diet sheets:—

The master cook prepares, and submits to battery commanders for approval, the battery diet sheets for each week.

Grocery slips:—

After approval of diet sheets, the master cook makes out the grocery slips for the ingredients actually required.

Messing book:—

The messing book remains in the hands of the battery commander.

Meat issue:—

The meat ration is drawn in bulk for the whole brigade. The master cook attends the issue of meat, and selects the joints most suitable for roasts, pies, and stews; to be approved by the orderly officer. Batteries are put on "roasts" in turn.

Battery cooks:—

Battery cooks are put through a course of cookery, and extra pay allowed to men employed in this capacity. This to be given only to cooks who are reported on satisfactorily by the School of Cookery; or who are already fully competent in their duties.

Assistant master cook:—

Each qualified battery cook is on duty for a month in turn as assistant master cook.

This system involves no radical changes. It can be taken up or discarded without any dislocation of routine.

Master cooks:—

The importance attache
brigade of artillery has recentl
of pay equal to that of a serj

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This offers great inducement to young N.C.O's to qualify for the appointment. The position is one of responsibility, and the success of any system of brigade messing must depend mainly on the energy and resource of the master cook; especially as regards the variation of the mens' diet.

The preparation of diet sheets and grocery slips should be entirely the province of the master cook. It is essential that his experience be utilised in this respect. And it is not fair on him to have the preparation of dinners for which the requisite ingredients are not forthcoming; or for which, on the other hand, ingredients may have been ordered in excess of requirements. The one case means a bad dinner, and the other leads to waste.

It must be understood that the scale of ingredients set forth at the commencement of the messing book is only a guide—an excellent guide, certainly—but not intended to supersede expert knowledge.

The preparation of diet sheets is frequently left to N.C.O's who have absolutely no knowledge of cookery and the relative food values. This leads to a badly balanced diet. On certain days, for instance, an excess of bread stuffs will be put on the table, such as meat puddings, followed by treacle puddings. Or the diet may show rice puddings following a curry and rice meat course. Or a vegetable stew may be preceded by a pea and lentil soup. The result is waste, since men will naturally refuse a diet which is not well balanced.

If, however, the dishes are properly distributed throughout the week according to their peculiar food values, this waste does not occur. The men eat better, and are in better health. But this cannot be secured without the scientific appreciation of food values, which the master cooks are taught at the School of Cookery.

A time table setting forth the duties of a master cook and his subordinates is appended. It serves as a useful guide and is capable of any necessary modification. It is compiled in accordance with the methods observed at the School of Cookery, Aldershot. Certain definite days and hours are allotted to the various kitchen duties. It is a mistake to have a sort of weekly spring cleaning. The work should be apportioned daily.

Battery cooks:—

The training of battery cooks at the School of Cookery,[1] should be secured when possible. It is neccessary to attract a specially good class of man for this work. Not long ago the idea was common enough that any man not sufficiently intelligent as a gunner would do for the kitchen. This fallacy cannot be too strongly condemned. Instead of stupidity, it is intelligence that is specially demanded of a battery cook. Men should be selected for their cleanliness, smartness, and sobriety. The health and contentment of the personnel of a battery are enormously affected by the care and skill bestowed on the cooking.

[1] By War Office circular batteries at stations where no master cook is available battery cooks can send men to School of Cookery, Aldershot. Vacancies should be made to the Staff Officer in charge.

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A case that occurred quite recently (not in the regiment) illustrates the lack of appreciation in certain corps, of the qualifications necessary for a soldier cook.

Serjeant to recruit recently posted from dèpôt: "You are to relieve Simpson in the cookhouse, there's the diet sheet, its meat pies."

Recruit: "Serjeant, I have'nt done no cooking in my life, and I don't know how to make a meat pie."

Serjeant: "That don't matter; you *get on with it*!"

It is worthy of remark that this casual treatment of the question was by no means uncommon in very recent years, and is solely due to ignorance. It still crops up occasionally.

The master cook is sometimes greatly handicapped through want of consideration in having the battery cooks and their assistants frequently taken away, and other men substituted. The work to be done has all to be learnt afresh. The assistant battery cook should not be changed, as the battery cook's time and attention are taken up in looking after an incompetent successor.

The unpopularity that sometimes attaches to the position of cook can be speedily overcome by recognition of the special qualities necessary in selection, and the encouragement of men so employed by the grant of extra pay and privileges.

Meat issue:—

The system of pooling the meat is of great assistance in the cooking. Each battery in turn secures the best roasting joints. Occasionally the master cook will be able to put a battery and a half on roasts; if for instance he draws a hind quarter of beef, which contains the best roasting joints.

The meat which is not suitable for roasting, is issued for stews, pies, &c., to batteries in turn. It is useless to attempt a roast with meat that can only be rendered fit for table by stewing.

In a brigade cookhouse, with three battery kitchens, it is an advantage to have one kitchen daily for roasts, another for stews, and the third for pies, &c. This makes for simplicity, and, therefore, easier supervision. A battery cook does not have his attention divided up between roasts, pies and stews, for different sections.

It will be found convenient for the master cook to present the diet sheets for the following week on each Friday morning. When passed by battery commanders, he makes out the grocery slips, which can be checked on Saturday.

A careful master cook will be able to effect considerable economy in the purchase of ingredients, and the money thus saved can be best spent in improving the breakfasts.

The master cook should be held responsible for the amount of dripping saved, in the proportion of ½ oz. dripping to the ordinary ration of 12 ozs. of meat.

The battery commander retains the control of expenditure, and by dealing directly with the master cook is able to fix the individual responsibility on the whole subject of the messing of his battery.

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Time Table of a Master Cook in charge of the Cooking of a Brigade of Artillery.

DAILY DUTIES.

Time.	Morning.	Time.	Forenoon.	Time.	Afternoon.
5.30	Open cookhouse and see that all fires required for breakfast are lighted.	8.30	Re-open the cook-houses for the cooks to resume work. Superintend the preparation of the Dinner meal giving practical instruction when necessary.	1.45	Re-open the cook-houses, inspect all cooking utensils returned by cook's mates also all steamers, ovens etc., used by the cooks, see they are thoroughly cleaned up and put away in the place set apart for them.
6.0	Issue to cooks articles required for breakfast and dinner.	9.30	Inspect the Stock Pot, see that the bones are broken small, the contents only simmering and that the scum is removed from time to time.	2.30	Take in the groceries for the following day, checking the items carefully.
6.30	Superintend the preparation of puddings and paste for dinner and give any instructions required.	10.0	Inspect the clarified dripping, weigh all dripping made and hand over to the Qr.-Mr. Sergt.	3.0	Prepare bacon, sausages, fish, etc., required for breakfast next morning also fruit , vegetables, etc., for dinner. See that all cooking vessels required for the following day are cleaned, marked and laid out ready for use.
7.30	All fires required for dinner to be lighted. Superintend the receipt of the meat ration recording the weight issued to each mess in the book kept for the purpose.	10.30	Inspect cook-houses to see that they have been properly cleaned especially benches, chopping blocks, sinks, grocery cupboard and floor.	3.30	The flues of the apparatus that has been in use to be cleaned, fires laid, ashpits emptied and boilers filled with water, bones removed from Stock Pot and put in a cool place; No. 3's thrown away.
7.45	Send breakfast away and close cook-house to enable the cooks to have their breakfast.	11.0	Inspect the dishes for dinner pointing out any errors to the cook, see that the joints have been turned, stews stirred and the gravy made.	4.30	Issue fuel for next day and articles required for tea. See the tea meal prepared. Inspect the cook-houses, see that everything is ready for the following day, the windows closed, place cleaned up and that each man is in possession of his detail for the next day's work.
		11.30	See that all green vegetables, rice etc., are made ready for cooking and potatoes placed on the steam. If soup is being prepared the thickening should now be added. Check the contents of the grocery cupboards.		
		12.30	Superintend the dishing up of the dinner meal. See that all liquid fat is removed and the gravy added before the dishes are sent to the barrack rooms. After the removal of the dinners wait until the Orderly Officer has completed his rounds, then close the kitchen for 45 minutes.		

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SWIMMING HORSES.

By COLONEL E. J. PHIPPS-HORNBY, V.C., R.H.A.

DURING the past summer the 1st Cavalry brigade, including three batteries of horse artillery, has been practised at Aldershot in swimming the horses across a river by a novel method devised by Brig. General the Hon. J. Byng. It is so simple, and proved so successful, that no doubt my brother officers will be glad to learn something about it, and, I hope, will practise it with their own batteries.

As most people know, the old method of swimming horses across a river always exposed both men and horses to some risk of drowning. Horses were either (1) led over by men in a boat, (2) driven into the water and left to their own devices to reach the further bank, or (3) were pilotted across by a man swimming with each horse or sitting on the horse's back.

But it is evident that (1) was very slow; (2) was unsatisfactory, as all control over the horses was lost, and they could land where they pleased, sometimes on one bank, sometimes on the other, or if so minded, they could swim down the middle of the river; (3) was always a dangerous operation, and even with men who were expert swimmers, the control they exercised over the horses was very limited.

In instructing us in his method, General Byng was careful to impress upon us that his method was meant only for taking small bodies of cavalry across a river when not hampered by a large amount of transport. In the latter case it would probably be better to build some sort of bridge.

To state it briefly, General Byng's scheme is to have an endless 2″ rope, anything bigger sinks too much and has to be so strained that it breaks, running through four snatch blocks, two on each bank, three of these are made fast to holdfasts, the fourth is fixed on to a tackle which in turn is fixed on to a holdfast, the object of this being that should the rope stretch, it can be adjusted, without slacking the rope, to the necessary amount of tautness,—it should be tightened whenever it sinks into the water at all. He claims for his system that, (1) there is absolutely no risk to human life, though occasionally through carelessness a horse may be drowned, (2) that the horses are compelled to land at the point at which it is wished to land them, and (3) that the system is very much quicker than any other.

The following is a detailed account of the method. All the stores required to carry it out were provided by the 1st Field Troop, R.E. Each of the cavalry regiments and of the Horse Artillery batteries was practised on three separate days at the cavalry swimming pond just below Hungry Hill. The pond varies in width from 150 yards to 100 yards, and across this two endless ropes were fixed, each in the shape of an irregular oblong. The holdfasts on each bank should be placed about thirty yards from the bank, and the distance

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General Tylden, you have already allowed me Sir, to break through your rules of discipline by prolonging my lecture fifteen minutes after the hour. But I have enough definite and deliberate pronouncements of leading authorities to support my views that would take a week of lectures. Gentlemen should get and read Huret's "Rhin et Westphalie." But it is only one very clear and concise book out of many.

I need not urge patriotism and industry and desire for knowledge on this audience. They are all well educated and diligent, and students of chemistry, and of various other branches of science, and they have devoted their lives to our service for very small reward, not equal to the remuneration of pacific chemists by the banks of the Rhine.

But, Sir, we civilians are very dull, narrow minded and obstinate. We mistake snobbery for "good form," and party for patriotism, hence we lag behind our soldiers and various races of foreigners. Yet it is as much our duty as it is yours to maintain the credit of our race, in science, brain power, physical power in war, commerce, literature, art, indeed, in all the conditions of individual and collective progress. It is the duty of each of us men and women to do all we can for our Mother Country and for our neighbours and our children, otherwise the story of the ruin of nations by the banks of the Rhine and elsewhere, will be retold at the close of the twentieth century by some future Gibbon, and the decline and fall of our United Kingdom and its Empire will be added to the list of nations that fell because they would not learn the "moral of all human tales."

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Some Remarks concerning The Royal Artillery at the Battle of Talavera, July 27-28, 1809.

By MAJOR JOHN H. LESLIE, R.A., (Retired List).

THE map here given of the battle-field of Talavera de la Reyna in Spain, belonged to General Sir E. C. Whinyates, K.C.B., Royal Artillery, and was given to me by his nephew, Colonel F. A. Whinyates, R.A.

It is of especial interest to Artillerymen, because it was made by an Artillery Officer (Lieutenant William Unger, who belonged to the Artillery of the King's German Legion, and who himself took part in the battle), and shows the exact position of all the British guns.

Table showing the Companies of Royal Artillery (attached to brigades of guns) which were present at the battle of Talavera.

Battalion.	Commanded by	Armament.	Designation in 1908.
1st.	2nd Captain Henry Baynes.	Light 6 Prs.	2nd Battery, R.F.A.
7th.	Captain Charles Doyne Sillery.	Light 6 Prs.	18th Battery, R.F.A.
8th.	Captain Robert Lawson.	3 Prs.	87th Battery, R.F.A.

Sillery, Lawson, and Baynes, received the small gold medal for Talavera, awarded to Officers commanding units.

Two companies of Artillery of the King's German Legion were present under the command of Captain W. L. Heise, and 2nd Captain C. von Rettberg, both of whom received the gold medal. These brigades were armed with light and heavy 6 prs., respectively.

The King's German Legion was a force composed of all arms (Cavalry, Artillery, Engineers, and Infantry,) and was a regular component part of the British army at that time—formed in England in 1803. It was officered by German Officers and chiefly composed of volunteers from the lately disbanded Hanoverian Army. The Legion was disbanded in 1815-16.

As Unger's writing on the map is not very distinct, I have thought it best to *print* the names, letters, &c. The map, as reproduced, is the same size as the original. The scale is about 1 : 15,000.

The following account of the battle is in Unger's writing on the body of the map.

Battle of Talavera. July 28, 1809.

The French crossed the Alberche on the 27 at about 3 oclock in the afternoon. The whole of the Spanish army was already retreated and in their position when General MacKenzie was surprised in a wood along the Alberche & retired.

At 5 o'clock the enemy attacked the right of the Spaniards and

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of marriage and consanguinity; and the adjacent tribes who solicited the alliance accepted the name and laws of the Saxons. If the fact were not established by the most unquestionable evidence, we should appear to abuse the credulity of our readers, by the description of the vessels in which the Saxon pirates ventured to sport in the waters of the German Ocean, the British Channel, and the Bay of Biscay. The keel of their large bottomed boats was framed of light timber, but the sides and upper works consisted only of wicker, with a covering of strong hides. In the course of their slow and distant navigation they must always have been exposed to the danger and very frequently to the misfortune of shipwreck; and the naval annals of the Saxons were undoubtedly filled with the accounts of the losses which they sustained on the coasts of Britain and Gaul. But the daring spirit of the pirates dared the perils, both of the sea, and of the shore; their skill was confirmed by the habits of enterprise, the meanest of their mariners was alike capable of handling an oar, of rearing a sail, or of conducting a vessel; and the Saxons rejoiced in the appearance of a tempest which concealed their design, and dispersed the fleets of the enemy."

I do not dwell on the conquest of Gaul by the Frankish followers of Clovis, a small band 5,000 strong, who started on a pilgrimage of conquest from their bleak homes between the Meuse and the Rhine. Their success was complete, and Clothilde, the wife of the Frank chief, was probably more influential in his conversion than all the arguments of ecclesiastics. He was a successful leader who gave his followers lands and booty, and his tribesmen joyfully followed their leader to the baptismal font. But he soon had to face a tremendous attack on the Rhine by Alemanni, about the fiercest of the German race. The northern part of Helvetia had been subdued by the ferocious Alemanni, who destroyed with their hands the fruits of their conquest. A province, improved and adorned with the arts of Rome, was again reduced to a savage wilderness; and some vestage of the stately Vindonissa may still be discovered in the fertile and populous valley of the Aar. From the source of the Rhine, to its conflux with the Mein and the Moselle, the formidable swarms of the Alemanni commanded either side of the river, by the right of ancient possession, or recent victory. They had spread themselves into Gaul, over the modern provinces of Alsace and Lorraine, and their bold invasion of the kingdom of Cologne, summoned the Salic Prince to the defence of his Ripuarian allies. Clovis encountered the invaders of Gaul in the plain of Tolbiac, twenty-four miles from Cologne, A.D. 496.

The Franks, after an obstinate struggle gave way, and the Alemanni, raising a shout of victory, impetuously pressed their retreat. But the battle was restored by the valour, the conduct, and perhaps the piety of Clovis, and the event of the bloody day decided for ever the alternative of empire or servitude. The last King of the Alemanni was slain in the field, and his people were slaughtered and pursued, till they threw down their arms, and yielded to the mercy of the conqueror. Without discipline it was impossible for them to rally; they had contemptuously demolished the walls and fortifications

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which might have protected their distress, and they were followed into the heart of their forests by an enemy not less active or intrepid than themselves.

Influenced by Clothilde the Franks became Christians in the same year.

The Devil's Wall and mighty works of Rome on the Rhine bank had ceased to protect the Rhine frontier by the eighth century. Fortunately for Gaul and the Pope, successor of the Cæsars in Rome itself, a strong wise man born by the Rhine banks arose to save and unite for a period western Christendom, to deliver Italy from Gothic usurpers and to save southern Germany and Gaul from the domination of the Saxons. This terrible race of heathens, whose chief altar was in honour of Arminius, held sway from the Lower Rhine to the Elbe. They made an incursion into France, Charlemagne crossed the Rhine and broke their power, and converted them to christianity perforce. But this conquest was only accomplished after a war of thirty years, almost as savage and ruinous a war as that war of Thirty years, 1618-48, which for a long period almost suspended the animation of the Rhineland, sacked and ruined by fell warriors like Tilly, and occupied by the Swedish and Scotch soldiers of Gustavus Adolphus.

Charlemagne was made Emperor of the West by the Pope, 800. He added a second head to the eagle to show that the Roman and German Emperors were united.

As the Rhineland preserved the traditions of the municipal and military life of old Imperial Rome, the princes of the new and Holy Roman Empire had their first important marts and altars and senate houses on the Rhine, and when the Empire of the Carolingians fell into decay, the Emperors and the elected heirs, kings of the Romans, like Richard, Earl of Cornwall and son of King John were selected, enthroned, and in many cases buried by its banks. In 1256, Richard accepted the title and was crowned at Aix-la-Chapelle with his wife Sanchir 1257, and won golden opinions from the poor Germans by his prodigal gifts. Though he wisely returned to England in two years, yet he several times revisited Germany and exercised considerable influence.

The Church began to rear her head again; the faithful began to erect these magnificent Cathedrals, Abbeys, Doms and other edifices, monastic and regular, which excite the admiration of the traveller. Feudalism followed as an instrument for order when the raids of the Saxons and Northmen and Huns and Goths had exhausted themselves. But the towers of the barons and their retainers were almost as great a menace to commerce and civilisation as had been the incursions of barbarism. In no part of Europe was feudalism more firmly planted, nor were its drawbacks felt longer, than by the banks of the Rhine, in fact some of its worst features, such as the loan of its subjects as mercenary soldiers by the Princes to England, lingered till the close of the eighteenth century.

The castles of the robber barons are now so attractive that one almost thanks their old owners for their ferocious skill in selecting commanding "coigns of vantage" for their blackmailing operations.

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"In their baronial feuds and single fields,
What deeds of prowess unrecorded died!
And Love which lent a blazon to their shields,
With emblems well devised by amorous pride,
Through all the mail of iron hearts would glide,
But still their flame was fierceness, and drew on
Keen contest and destruction near allied
And many a tower for some fair mischief won,
Saw the discoloured Rhine beneath its ruin run."

The Rhine was by far the most important centre of commerce in Europe, and the avenue between Britain, most of France, Belgium, and great part of Germany and Italy. It was the via Saxonica of English pilgrims and traders to Rome, the city of the Soul of those days, and its merchants joined the mercantile Federation of the Baltic towns and German Sea, and became strong enough not only to beat down the barons, but also to fight Scandinavia and to win recognition from the Emperor.

The rise of the Dutch in the sixteenth century, their narrow commercial policy which led to great naval actions with the English in the times of Cromwell and Charles II; the closing the mouths of the Rhine, Meuse, Scheldt, between 1625 and 1815, and the general transference of trade to Atlantic ports after the discovery of the Americas; were fatal to the cities of the Rhineland. But their strategic importance continued and it is no exaggeration to say that millions of men passed on their career of slaughter backwards and forwards from the time of James I of England, till 1815. The thirty years war, 1618-48, was a terrible time, and scarcely less terrible were the splendid campaigns of Turenne and Montecuculi, but the climax of horror was the devastation of the Palatinate by Louis XIV.

"At this moment France was not strong enough to hold the conquests which she had made. Louis now hearkened to the diabolical councils of Louvois. From the Court of Versailles, the model of politeness, the centre of European refinement, issued a mandate which might have disgraced Attila or Zinghis Khan. The French Generals were ordered to burn the towns and villages they could not garrison, lest they should be occupied by the enemy. Heidelberg, the residence of the Elector Palatine, was one of the first places abandoned to the flames, and the ruins of the magnificent electoral palace still attest this act of ferocious barbarity. These orders were soon afterwards followed by others for a more wholesale destruction nothing less than the burning of all places near the Rhine between Mentz and Philipsburg. Spires, Worms, Oppenheim, Frankenthal, Bingen, and other places, with their beautiful Cathedrals and Churches and their ancient mediæval monuments, became a prey to the flames, and all that smiling region assumed the aspect of a desert. Altogether, more than forty towns and villages were burnt. A hundred thousand homeless human beings wandered about in search of some refuge for their misery, imprecating curses on the French and their cruel King, and demanding vengeance at the hands of the Empire and of Europe." See "Dyer's Modern Europe."

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I must hurry on, and merely refer to our own illustrious General Marlborough's celebrated strategic marches from Holland to Mayence, and thence to Blenheim on the Danube, and thence back to the Meuse and the Dyle, 1703-5. This in itself would be a striking proof of the importance of the Rhine valley. I pass over the wars of the Austrian Succession, Seven Years War, Berwick's Campaign, 1743, and the constant movements across the Rhine, 1793-97, and the wars of Napoleon. The British fought again and again in the Rhineland and Belgium and Holland, from the time of William III, till Waterloo. I shall only mention one deplorable incident, part of the retreat from Belgium through Holland over the Rhine and Bremen, 1793-95.

The French having crossed the Waal, the murmurs of the British induced their commanders to assume the offensive, and General David Dundas on the 30th December carried the French entrenchments at the village of Tuil at the point of the bayonet, and chased the enemy across the frozen Waal. But on the 3rd January, 1795, they recaptured Tuil from the troops of the Prince of Orange. Skirmishes occurred almost daily, and the weather grew still more inclement. A general advance of the French began, and there was no hope now of saving the Low Country from the masses of French troops who, in rags and miserably fed, were inspired with the enthusiasm of a political creed which had become almost a religion. After a repulse of the enemy by the Guards at Rhenen on the 14th January, Walmoden began a retreat beyond the Yssel, but the Government had resolved to embark the troops at Bremen, and the march was, therefore, continued over the bleak moorland to the Ems.

The retreat across that desolate region is as terrible as any in the annals of the British army. The Dutch population in the villages were very hostile, and any straggler from the main body was maltreated; the cold was so intense that brandy froze in bottles, a mantle of snow covered the country, and there was no shelter from the piercing winds on an almost desert plain. The ill-judged indulgence of the Government permitted the families of soldiers to accompany the regiments, and hundreds of women and children were frozen to death in the wagons, or, lying down on the plain, were covered with the drifting sand and snow.

It was not till the 24th February that any French forces appeared; on the 1st March there was another skirmish near Dollart; on the 4th the Ems was crossed, and the country was now in so swampy a condition from the thaw that the enemy gave up the pursuit. Falling back on Bremen, nearly all the survivors of the wasted battalions embarked on the 12th April, and reached England in safety.

The War of Liberation against Napoleon, 1813-14, surpassed all previous efforts of Eastern and Central Europe against France and Italy, both under the self-styled successor of Charlemagne. No Goth, no Hun, ever led such a numerous host as passed the Rhine at Düsseldorf, Cologne, Coblentz, Mayence, Basle, on the road to Paris, January to April, 1814. But even this enormous migration of the brain power and disciplined physique of Europe against France was surpassed in 1814. No fewer than 700,000 allies in first line, and

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300,000 in reserve moved on Paris from Brussels, Cologne, Mayence, Mannheim, and the Middle Rhine; all trained soldiers, British, Prussian, North and South Germans, Russians.

But in 1870-1 the Germans alone put 1,000,000 in France and took Paris. Look at the map of the modern frontiers of France and see how far the Germans have realised their "Watch by the Rhine"; not one acre of land by its banks is now under Gallic rule.

The Rhine of Commerce:—

So much for romance and poetry and strategy, but we must now pass from the Rhine of Moltke and Werther to the modern Rhineland, and its marvellous expansion of commercial industry in our generation. This is phenomenon beyond compare. The chimney of the factory and the smoke of the furnace now tower far above the Gothic shrine and the feudal castle and the Roman fortress.

French and British are in danger of being beaten, not only in regard to philosophy and war, but in regard to those very industrial arts and enterprises in which they fancied they had secured pre-eminence beyond all chance of rivalry. I beg you to reflect on the maps before you. Look particularly at Bremen, and Westphalia and the Rhine from Cologne to Düsseldorf, and study its statistics, and look at the industries of Frankfort and Barmen, and Eberfeld and Essen, and many other places. Consider the effect on Holland of the proposed canals. Try to ascertain the whole truth about Emden and Whilhelmshafen and the Frisian islands, and ask your civilian friends if our organisation, military, scientific, industrial, educational; if our aims, our cliques, our games, our spectacles, our plutocracy are in keeping with our Imperial responsibilities. Are you satisfied with our position and prospects? I trow not.

Well, I am not going to give any reports of my own. I have seen part of the Rhineland before it was overwhelmed with its hideous deformities of modern factory life, and I have seen parts of the same territory since. I admit that more has been done for the workman and his family to prevent their being degraded into mere adjuncts of machinery than is done here. But the prospect was not pleasing; I would prefer to be a follower of Attila or a Saxon oarsman or a Hessian mercenary, than to be a "factory hand." I see nothing good whatever to the future of humanity in this manufacturing maelstrom. The more furnace fires we light, the fewer sparks and particles of the Divine essence irradiate our souls. To me the immortal part of us is everything unless man is to be lower, not only than the angels, but lower than beasts. I do not believe that money is the sinews of war. I see no Pisgah view of the future of humanity in a mill. The hum of the wheels and the roar of dynamos have no relation to the harmony of the spheres. But if commerce, and chemistry, and production in factories, and steel trade, and coal trade, and textile industries, and leather industries be good for States, then if we do not awake and arise and shake our hitherto invincible locks, the commerce of the Rhine will soon defeat the commerce of Lancashire and of the Thames valley as totally as the Franks defeated the Alemanni. The distinguished French author and publicist

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M. Huret went to the manufacturing centres of the Lower Rhine and Westphalia to try to learn whether the German industries were surpassing the French. But to his amazement he also learnt that they were defeating the English, and *why?*

I will read, Sir, with your permission a few extracts and then conclude, having I fear utterly exhausted the patience of my audience without more than touching the fringe of my subject.

Military Training and Commercial Success:—

"A German Ambassador to whom I expressed my astonishment at the discipline that pervaded all ranks of the Nation, said in reply. "Without discipline, and indeed without military discipline, the admirable order which you describe as existing in even our smallest villages, and in all our public and private administrations could not exist. The German is by nature slow and heavy. If he be not managed by strict methods, he gets anchylosed and sluggish and goes to sleep. But above all without organisation and discipline, there could not be developed amongst us any national life, and there could be no real prosperity. You can see this for yourself in the records of our petty little princedoms."

The authorities given by M. Huret were men of affairs, and void of local prejudices, and quite ready to admit that other methods might suit better the genius of Britons or French, but they were discussing Germans. I may add that I heard similar remarks on the discipline and organisation of German Socialists by English Socialists returning from the late conference in Stuttgart. They assured us that the discipline of the German Socialists made the efforts of other European Socialists, especially the English, appear somewhat contemptible and futile.

The German Steel Industry:—

Herr Thyssen is one of the most powerful "Captains of Industry" in Germany. He employs 22,000 men, i.e. an Army Corps, and he treats them not in accordance with the despicable views of the Manchester School—that odious system of national and physical and moral degredation—as if they were " hands," but as human beings with hearts and souls, as well as hands. He has a port of his own, his works cover 7,000 acres, and he produces annually 1,700,000 tons of steel and cast iron. He told M. Huret that the German Steel Trust had not only faced, but defeated the competition of the powerful American Steel Trust.

The Industrial Rhineland:—

" Behold us in the centre of the wealthiest region of Germany, and the magnificent highway of the Rhine which is in itself an incomparable fortune, enriched also by the waters of its affluents, which give life to textile industry, collieries, steel works, dye works, and chemical products. Moreover, the country is full of mineral wealth. The coal of the Ruhr basin is estimated at 129 milliards of tons, a sufficient stock for some centuries to come. the country is

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also rich in its network of railways which radiate from Düsseldorf all over the land, literally like the threads of a spider's web. Public railways and private railways connect the mines with the factories, carry produce to the river and canal banks as a methodical and permanent tribute, and carry back in exchange produce from the ships coming from the sea with admirable facility, convenience and regularity. On a surface of 100 kilometres we counted 76 kilometres of railways. I have made many excursions in this breeding ground of Prussian wealth. It is within a radius of 40 kilometres that all this enormous richness is distributed. Cologne has 50,000 inhabitants, Düsseldorf 254,000, Essen 231,000, Eberfeld 162,000, Barmen 156,000, Crefeld 110,000, Dortmund 175,500, Bochum 118,000, Duisburg 192,000, Hagen 770,000, Mulhe-sur-la-Ruhr 93,600, Munchen-Galdbach 607,000, Oberhausen 52,000, Remscheid 64,000, Solingen 50,000. I stop, I do not discuss the innumerable villages depending on these towns, villages of 2-3-4-5000 inhabitants humming around the great industrial centres; a stupendous agglomeration which has not its equal in Europe, not even in Lancashire."

Might I ask my audience to take up any book of statistics, and contrast Lancashire in 1874, with this district in the same year, and then look at the strategic topography of both districts and of all north-west Germany and eastern England and to reflect. It would be well if both parties in the State were to weigh and to consider these amazing facts before making any more gushing and "patriotic" harangues. Playing to the gallery is deceiving the Nation. Let us be true men, especially as Truth doth not lie at the bottom of any well; its image and reflection can be studied in any Library, and indeed in any Atlas and Encyclopœdia.

We are a Sea Power, and Sea Cables are of the utmost consequence to our commerce and our Naval supremacy. In regard to electricity and the manufacture of land cables and over-sea cables and all German transmarine system, Germany only began to compete with England in 1890, and is now not only completely independent of our aid, but is a serious competitor in our markets.

In fifteen years this new German industry has distanced ours. One of the directors of the Submarine Cables factories said, "we are selling entire systems to England. The English have remained stationary, their guttapercha cables cannot sustain very high tension. We make fibre cables which are treated with impregnations and which can endure the most powerful currents. Hence this English industry is behind hand. The proof is that we have recently delivered cables to Glasgow, and that the works of "Guilloume de Leverkus a fourni tout le reseau de Londres."

Cologne more than rivals its former greatness under the Hanseatic League, when the high status of its merchants was recognised by our Plantagenets. Its port possesses a splendid electrical station, and a system of hydraulic force which gives a pressure of 90,000 kilogrammes. Its traffic is vast. Thirteen thousand ships are moored yearly at its two kilometres of quays. They come from Rotterdam, Antwerp, Amsterdam, Riga, Hamburg, Dantzig, Königsburg, and even from America direct. They are divided into sea-going vessels

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which are chartered direct to Cologne, river boats from Belgium and Holland, and boats coming from the interior, from Strasburg to the frontier of Holland.

"Germany presents us with this strange spectacle; the complete expansion of an ancient and poor people, on whom fortune has at last smiled. Surprised and delighted they fall to work, they press boldly forward on the roads of enterprise, they lead the way in the most frequented path of modern speculation and industry, and when work is over they get all the comfort and enjoyment possible out of their lives."

Here are ominous words which should come home to every man and woman in this room. "I had learned from books of statistics that the Germans having surpassed the French in all branches of manufacture were about to swallow up England (apres nous avoir distancés dans presque toutes les branches du commerce et de l'industrie était en train de manger l'Angleterre) Germany has gained economic mastery over Scandinavia and the Balkan States, and is now on a footing of equality with England in Italy and Spain, and is in the way of gaining commercial predominence in the East.

Already the English yearly lose influence in their own colonies, and are rivalled successfully in their own isle. Soon they will be beaten by the Germans in Canada, Australia, New Zealand, the Cape, and India."

Leather Industry:—

"After France, England for a long period held the second place in the market for coarse and fine Morocco and other leathern work. But to-day a client from London has spent 60,000 marks in purchasing valises, bags, portmanteaus, and purses."

Chemical Industries. Dyes:—

At Hoechst 190 chemists of high position work in splendidly equipped laboratories in search of new combinations, and its analysis for commercial purposes. Mainkur produces 3,000 different colouring products, among which are 300 kinds of black. "But" as a leading manufacturer said to M. Huret "England and France could easily have beaten Germany, as even to-day we Germans are tributaries to foreigners for 270,000,000 francs worth of materials."

"In chemical industries England is beaten by us Germans."

"If we reflect that Germany only started these industries thirty years ago, we stand amazed and perplexed before such a result. Thirty years ago England had no competitor in the market for salts of alkalis. And for the manufacture of colouring matters from the distillation of coal tar. It was far in advance of Germany."

"In fact it was at the period of the Crimea that the Englishman Perkins extracted Mauveine from coal tar, and Germany then possessed very few gas works, indeed it bought coal tar from its English neighbour. In 1886, it has 4,000 works, employing 78,000 workmen, at a total salary of 61,000,000 francs. In 1907, Germans are ahead of English, not only in the manufacture of colouring materials, but also in that of chemical and pharmaceutical materials."

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General Tylden, you have already allowed me Sir, to break through your rules of discipline by prolonging my lecture fifteen minutes after the hour. But I have enough definite and deliberate pronouncements of leading authorities to support my views that would take a week of lectures. Gentlemen should get and read Huret's "Rhin et Westphalie." But it is only one very clear and concise book out of many.

I need not urge patriotism and industry and desire for knowledge on this audience. They are all well educated and diligent, and students of chemistry, and of various other branches of science, and they have devoted their lives to our service for very small reward, not equal to the remuneration of pacific chemists by the banks of the Rhine.

But, Sir, we civilians are very dull, narrow minded and obstinate. We mistake snobbery for "good form," and party for patriotism, hence we lag behind our soldiers and various races of foreigners. Yet it is as much our duty as it is yours to maintain the credit of our race, in science, brain power, physical power in war, commerce, literature, art, indeed, in all the conditions of individual and collective progress. It is the duty of each of us men and women to do all we can for our Mother Country and for our neighbours and our children, otherwise the story of the ruin of nations by the banks of the Rhine and elsewhere, will be retold at the close of the twentieth century by some future Gibbon, and the decline and fall of our United Kingdom and its Empire will be added to the list of nations that fell because they would not learn the "moral of all human tales."

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Some Remarks concerning The Royal Artillery at the Battle of Talavera, July 27-28, 1809.

By MAJOR JOHN H. LESLIE, R.A., (Retired List).

THE map here given of the battle-field of Talavera de la Reyna in Spain, belonged to General Sir E. C. Whinyates, K.C.B., Royal Artillery, and was given to me by his nephew, Colonel F. A. Whinyates, R.A.

It is of especial interest to Artillerymen, because it was made by an Artillery Officer (Lieutenant William Unger, who belonged to the Artillery of the King's German Legion, and who himself took part in the battle), and shows the exact position of all the British guns.

Table showing the Companies of Royal Artillery (attached to brigades of guns) which were present at the battle of Talavera.

Battalion.	Commanded by	Armament.	Designation in 1908.
1st.	2nd Captain Henry Baynes.	Light 6 Prs.	2nd Battery, R.F.A.
7th.	Captain Charles Doyne Sillery.	Light 6 Prs.	18th Battery, R.F.A.
8th.	Captain Robert Lawson.	3 Prs.	87th Battery, R.F.A.

Sillery, Lawson, and Baynes, received the small gold medal for Talavera, awarded to Officers commanding units.

Two companies of Artillery of the King's German Legion were present under the command of Captain W. L. Heise, and 2nd Captain C. von Rettberg, both of whom received the gold medal. These brigades were armed with light and heavy 6 prs., respectively.

The King's German Legion was a force composed of all arms (Cavalry, Artillery, Engineers, and Infantry,) and was a regular component part of the British army at that time—formed in England in 1803. It was officered by German Officers and chiefly composed of volunteers from the lately disbanded Hanoverian Army. The Legion was disbanded in 1815-16.

As Unger's writing on the map is not very distinct, I have thought it best to *print* the names, letters, &c. The map, as reproduced, is the same size as the original. The scale is about 1 : 15,000.

The following account of the battle is in Unger's writing on the body of the map.

Battle of Talavera. July 28, 1809.

The French crossed the Alberche on the 27 at about 3 oclock in the afternoon. The whole of the Spanish army was already retreated and in their position when General MacKenzie was surprised in a wood along the Alberche & retired.

At 5 o'clock the enemy attacked the right of the Spaniards and

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our left with much violence, took the hill x which was two times taken and retaken and at last retaken and maintained by General Hill's Division and Battalion, K.G.L.

In the morning at day light the enemy attacked our left again in order to gain the hill but was repulsed. The Heavy Artillery 6 Prs. was then sent from the right of the 4th Division to the left of the K.G.L.

A cannonade from both sides continued till about 12 oclock when a complete armistice took place for 2 hours.

At 2 oclock a very heavy cannonade began. The Guards were attacked by a Division. The Heavy Brigade 6 Prs. was then ordered to the right of the K.G.L. to assist the Guards and in half an hours time the French retired in disorder after the Guards had charged them with the bayonet.

In the mean while a Division of about 15,000 French attempted to attack the hill again but was stopped by our Cavalry, the 23rd Light Dragoons and 1st Hussars, K.G.L., charging their columns, which attack, however, did not succeed. A ditch, the steadiness of the enemies columns, & the fire of their artillery prevented the succeeding of the charge. At about 5½ or 6 oclock General Sebastiani with 15,000 infantry and cavalry advanced till about 200 yards before our centre, when the whole charged them. The 78th regiment which was in the rear came up in assisting of the 7th battalion, K.G.L., and short after the French were repulsed. No further attack took place since. The cannonade continued till dark.

At day light the French retired, leaving the wounded and 2 brigades of artillery in our hands.

A division of about 20,000 French troops, under the command of King Joseph did not take part of the enemy's attacks, but kept the Spaniards (by a distance of about 2500 yards) in tranquillity.

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a.	Brigade heavy 6 Prs.	Captain W. L. Heise, Artillery, K.G.L.
b.	Brigade light 6 Prs.	2nd Captain W .G. Eliot, R.A.
c.	Brigade light 6 Prs.	Captain C. D. Sillery, R.A.
d.	Brigade light 6 Prs.	2nd Captain C. von Rettberg, Artillery, K.G. Legion, and 4 Spanish guns and howitzers.
e.	Brigade light 3 Prs.	Captain R. Lawson, R.A.
f.	Reserve ammunition.	

(sd). W. Unger, Lt.,
German Artillery.

It will be noticed that in the above key list to the positions of the various brigades of artillery on the map, "b" is shown as the brigade of " 2nd Captain W. G. Eliot." This was the brigade to which May's company, of the 1st battalion, was attached. Incidentally the question arises as to who actually commanded this brigade in the battle.

This company, now represented by 2nd Battery, Royal Field Artillery, landed at Lisbon on March 6, 1809, under the command of Captain J. May. May, however, soon left it, and for the entire

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duration of the war was employed on the R.A. staff, and never rejoined. The command naturally devolved upon the 2nd Captain, Henry Baynes, and from the information contained in Battery Records, it has always been understood that Baynes was in command at the battle of Talavera.

But, in Professor Oman's " History of the Peninsular War," Vol. II., page 512, the following paragraph—foot-note—occurs, referring to the disposition of the artillery at the battle:—

" These details I give from the valuable (unpublished) map by " Lieut. Unger of the K.G.L. Artillery, which Colonel Whinyates " has been good enough to place at my disposition."

" It carefully marks the emplacement of every British Battery.[1] " Eliot was at this moment in command of the battery which had " been under Baynes during the Oporto campaign."

On page 655 of the same volume, a list is given of the brigades, R.A., present at Talavera, of which Captain J. May's company, of the 1st battalion, "under 2nd Captain W. G. Eliot" is one.

The names of five Captains are given on Unger's map as commanding brigades of guns in the battle—R. Lawson, C. D. Sillery, W. G. Eliot, Royal Artillery, W. L. Heise, and C. von Rettberg, King's German Legion Artillery.

To each of these, Eliot excepted, was awarded the Gold medal for Talavera, *and to Baynes as well*, and there is amongst the Dickson MSS. a letter from Baynes on this very subject, dated Woolwich, November 16, 1813, submitting his claim to the Gold medal for Talavera, in which the following passage occurs:—

" The brigade I then [i.e. at the battle of Talavera. J.H.L.] " commanded was attached to the 3rd division, forming the advance " of the army, and was engaged with it on the day preceding the " general action, and in the latter it was of course also warmly en- " gaged; during this I was with it, until obliged to be taken from the " field on the 28th, in consequence of a wound."

Eliot at this time belonged to Captain J. P. St. Clair's company, of the 5th battalion, stationed at Chatham, and in the company muster rolls for July, August, and September, 1809, he is shown as "on com- " mand" at Lisbon.

He was certainly present at the battle of Talavera because he received the silver " General Service medal, 1793-1814," with clasp for Talavera, which was granted in 1847, and this fact is in itself, I think, the best proof that he *did not command a brigade*, for if he had done so he would have been entitled to the Gold medal.

Eliot may possibly have taken up the command of Baynes's brigade when the latter was wounded, and it is not unreasonable to suppose that when Unger was collecting materials for his map he put down the names of Officers who were actually on the spot at that particular moment.

In 1811 Eliot published "A treatise on the Defence of Portugal,"

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1 Note by Professor Oman. "The word '*battery*' is technically an anachronism. The unit which "in 1908 is called a '*battery*' was in 1809 styled a '*brigade of guns*.' But I found that in mixed narra- "tive of battle, where artillery was not the only subject in question, the use of the terms '*brigade*' "and '*troop*' cause hopeless confusion—and that not only to civilian readers."

"To an audience of Gunners the words '*brigade*' and '*troop*' are all right, but with any other audi- "ence they often lead to misconceptions."

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in which the greater part of one chapter is devoted to a description of the battle of Talavera, but no mention is made of himself as having commanded a brigade of Artillery.

I referred this question to the late Colonel Whinyates, and he entirely agreed with the view expressed above, viz. that Baynes, *not* Eliot, was in command, holding the opinion that the extract from Baynes's letter settled the point without the possibility of doubt, and he was especially desirous that the mistake should be corrected in any future edition of Professor Oman's History of the War.

I also referred the matter to Professor Oman who writes—May 25, 1907—" If I had seen Captain Baynes's letter of 1813, I should " (like Colonel Whinyates) have abandoned Unger's theory that " Eliot was in command."

Mention may be made here of a quaint incident at the battle of Talavera in which Captain Sillery played the chief part.

It is related by the late General Sir E. C. Whinyates in some " Notes on the War Services " of Sillery's company "from January " 1809 to April 1813,"[1] which were compiled by him "when command- "ing the 7th battalion at Woolwich, about the year 1832." The details were obtained from private letters of Bt. Major H. B. Lane, R.A., who during the period referred to—1809-13—was 2nd Captain of Sillery's company. The story is as follows:—

" There is an anecdote of Captain Sillery on this occasion which " shows so much proper military feeling that it ought not to be omit- " ted,although it is difficult from the nature of the subject to introduce. " On the day of the battle of Talavera, Captain Sillery was labouring " under diarrhœa, and, unfortunately, at a time that his brigade was " most hotly engaged he was violently attacked by the complaint. " Turning to an Officer near him, he said, ' I shall not go to the rear, " it may be said I was afraid.' He then deliberately walked a hundred " yards in front of the brigade, and disembarrassing himself of part of " his clothes, yielded to the irresistible necessity of the case; after " readjusting his dress, and calmly putting on his sword and sash, " he returned leisurely to his post. The transaction excited a good " deal of mirth, notwithstanding the heat of the action, and a gunner " exclaimed, ' by my soul, our Captain is a sound and a staunch one.' " There could not be a better moral to the anecdote."

" Not long after, the brigade had the ill fortune to lose its brave " Commanding Officer. Captain Sillery died on the 30th of Septem- " ber, 1809, when encamped under the walls of Badajoz."

It has been stated above that the Gold medal for Talavera was awarded to Sillery. This is not, however, strictly accurate, because the medal was not actually awarded until July 1, 1815, nearly six years after his death. The following extract from a letter dated, " Horse Guards. July 1, 1815 " addressed to Mrs Sillery, fully explains the matter.

" Madam, The Prince Regent having been graciously pleased to " command, in the name and on behalf of His Majesty, that the " Officers present at the battle of Talavera should be permitted to

[1] See "Proceedings, R.A. Institution," Vol. XIV., in "Notes by various hands," issued with the September number of 1886.

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"bear a medal commemorative of that brilliant victory, I have to "transmit to you the medal which would have been conferred upon "the late Captain Sillery and which the Prince Regent has been "pleased to direct should be deposited with his family as a token of "the respect which His Royal Highness entertains for the memory "of that Officer."

(sd). "Frederick, Commander in Chief."

Sillery was appointed to the Royal Artillery as a 2nd Lieutenant on September 8, 1794, without having been at the Royal Military Academy as a cadet. He was promoted to the rank of Capt.-Lieutenant on September 1, 1798, and to that of Captain on October 13, 1804.

The portrait here given is copied from a miniature, the property of Major C. C. A. Sillery, Indian Army, a member of the family, who has most kindly allowed it to be reproduced.

Captain Charles Doyne Sillery, Royal Artillery.

Major Sillery also possesses his ancestor's Talavera gold medal, and the original letter addressed to Mrs Sillery regarding its presentation, and he has furnished the following information concerning the ancestry of C.D.S.

"Charles Doyne Sillery was descended from a French Huguenot "family long domiciled in the county of Meath, Ireland, and was a "son of Anthony Sillery."

"The latter appears to have been of some local civic importance, "as both he and his father—also named Charles Doyne—were at "different times sheriffs of the then important town of Drogheda, "and Anthony was Mayor in 1797."

Captain Sillery's son—also a Charles Doyne Sillery—published in 1834 a volume of poems, entitled "The Royal Mariner."

One of the poems is called "My Father. The Field of Talavera," and judging from it, one is forced to the conclusion that the poet

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must have thought that his father died as the result of wounds received in that battle. Four of its eight verses are here given:—

" All mournfully,—yet calm and mild,
" I saw a warrior—self exiled—
" Kneel by the cradle of his child;
" Near the field of Talavera."

* * * * *

" See where the crimson torrent streams;
" See where the steel-clad harvest beams;
" See where the red artillery gleams,
" On the field of Talavera."

* * * * *

" The dreadful work of death is done;
" A widowed wife, a sireless son,
" Are left to weep a battle won,
" On the field of Talavera."

" Victorious Peace herself may mourn
" That he shall never more return:
" Oh! dig his grave, and raise his urn,[1]
" On the field of Talavera."

As a prefatory Note to this poem is given the letter above quoted from the Commander in Chief (July 1, 1815) notifying to Mrs Sillery the award of the Talavera Medal, and the following extract from a letter of Brig. General E. Howorth, R.A., dated from Badajoz, October 4, 1809:—

" Captain Charles Doyne Sillery died on Saturday, about half " past two in the morning, on the 30th of September, after having " distinguished himself in a very particular manner, in both the ac- " tions of 27th and 28th of July, at Talavera, where he behaved with " conspicuous gallantry. He was much beloved and respected by " his brother Officers, and his loss deeply lamented."

The idea which the poet formed and embodied in verse appears, like " the red artillery," to be quite fanciful, and not in any way borne out by recorded facts.

In the official returns of Officers killed, wounded, and missing, the following Royal Artillery casualties are given:—

Killed.	Lieutenant H. Wyatt (May's company).
Wounded.	Lieut. Colonel H. Framingham. 2nd Captain H. Baynes (May's company). 2nd Captain J. Taylor (Lawson's company).

Taylor was left in hospital at Talavera after the battle, and fell into the hands of the French. He is frequently mentioned in a book entitled " A Prisoner of France," by Captain Charles Boothby, R.E., (London: Adam and Charles Black. 1898), who also was wounded at Talavera. Boothby's leg was amputated, and with Taylor he was taken prisoner by the French.

[1] Foot-note by the poet. "My Father's remains were deposited in the cathedral of Badajoz in "Spain."

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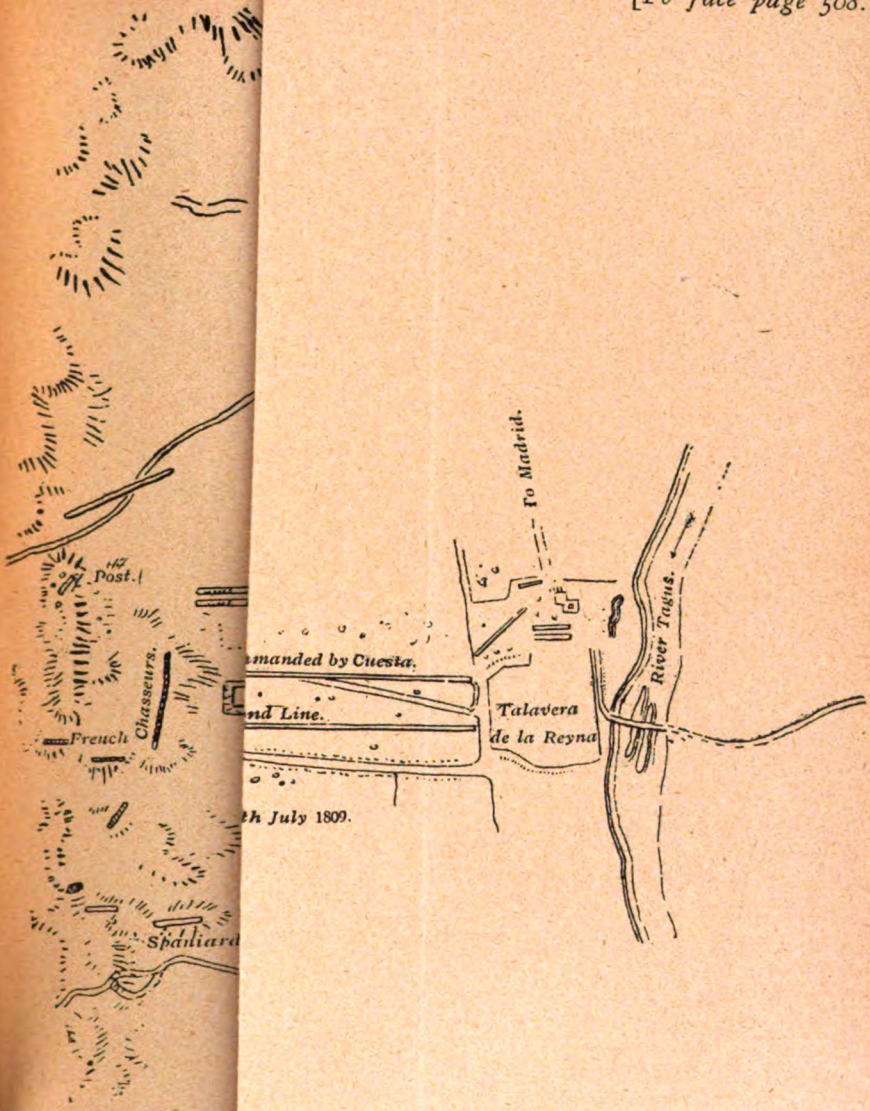

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SWIMMING HORSES.

By COLONEL E. J. PHIPPS-HORNBY, V.C., R.H.A.

DURING the past summer the 1st Cavalry brigade, including three batteries of horse artillery, has been practised at Aldershot in swimming the horses across a river by a novel method devised by Brig. General the Hon. J. Byng. It is so simple, and proved so successful, that no doubt my brother officers will be glad to learn something about it, and, I hope, will practise it with their own batteries.

As most people know, the old method of swimming horses across a river always exposed both men and horses to some risk of drowning. Horses were either (1) led over by men in a boat, (2) driven into the water and left to their own devices to reach the further bank, or (3) were pilotted across by a man swimming with each horse or sitting on the horse's back.

But it is evident that (1) was very slow; (2) was unsatisfactory, as all control over the horses was lost, and they could land where they pleased, sometimes on one bank, sometimes on the other, or if so minded, they could swim down the middle of the river; (3) was always a dangerous operation, and even with men who were expert swimmers, the control they exercised over the horses was very limited.

In instructing us in his method, General Byng was careful to impress upon us that his method was meant only for taking small bodies of cavalry across a river when not hampered by a large amount of transport. In the latter case it would probably be better to build some sort of bridge.

To state it briefly, General Byng's scheme is to have an endless 2″ rope, anything bigger sinks too much and has to be so strained that it breaks, running through four snatch blocks, two on each bank, three of these are made fast to holdfasts, the fourth is fixed on to a tackle which in turn is fixed on to a holdfast, the object of this being that should the rope stretch, it can be adjusted, without slacking the rope, to the necessary amount of tautness,—it should be tightened whenever it sinks into the water at all. He claims for his system that, (1) there is absolutely no risk to human life, though occasionally through carelessness a horse may be drowned, (2) that the horses are compelled to land at the point at which it is wished to land them, and (3) that the system is very much quicker than any other.

The following is a detailed account of the method. All the stores required to carry it out were provided by the 1st Field Troop, R.E. Each of the cavalry regiments and of the Horse Artillery batteries was practised on three separate days at the cavalry swimming pond just below Hungry Hill. The pond varies in width from 150 yards to 100 yards, and across this two endless ropes were fixed, each in the shape of an irregular oblong. The holdfasts on each bank should be placed about thirty yards from the bank, and the distance

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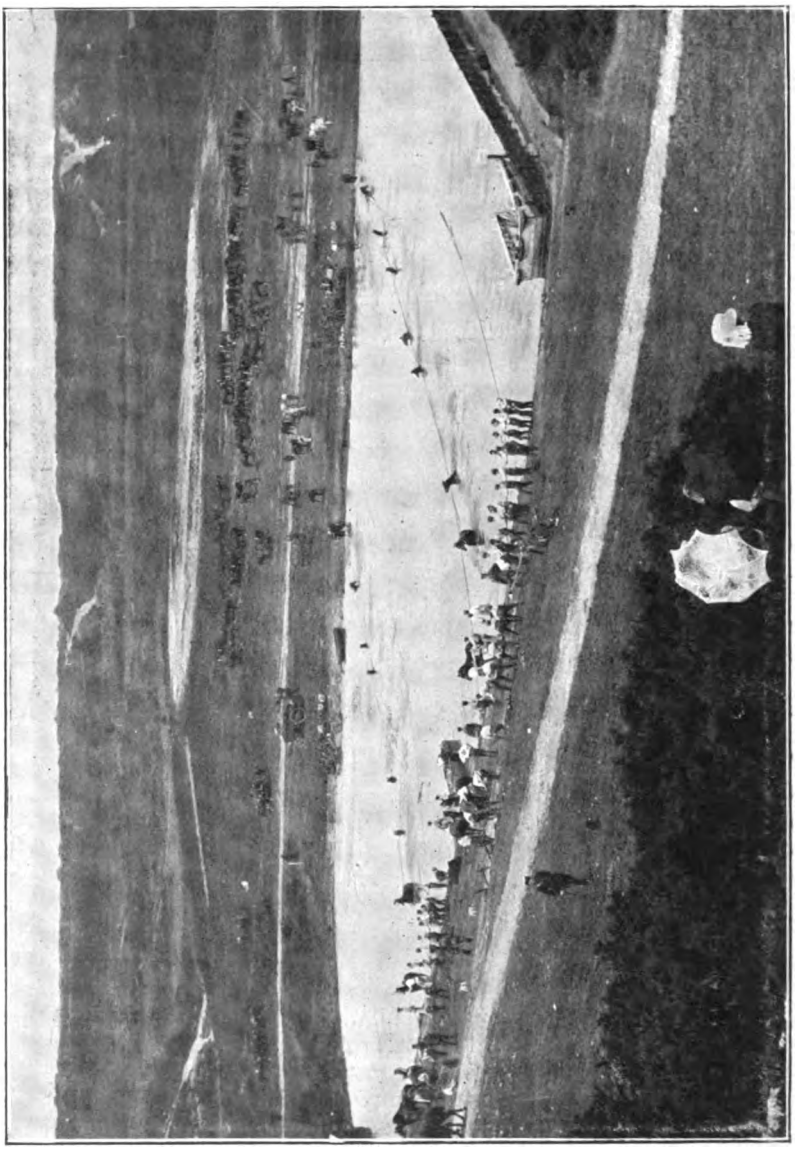
along the bank between them should be about forty yards. The rope should be so adjusted that it is about eighteen inches above the water, it must not be too tight or the effort to pull it fast enough is too great.



[Photo by Mr. John Chew, Aldershot. Copyright].

Now we will consider that a unit has reached the piece of water which it is desired to cross and that the endless rope has been fixed up as explained above. Of course some sort of boat or raft is necessary. The horses are unsaddled, and only a head collar and a good head rope is left on each. The saddles, bridles, and mens' kits of a

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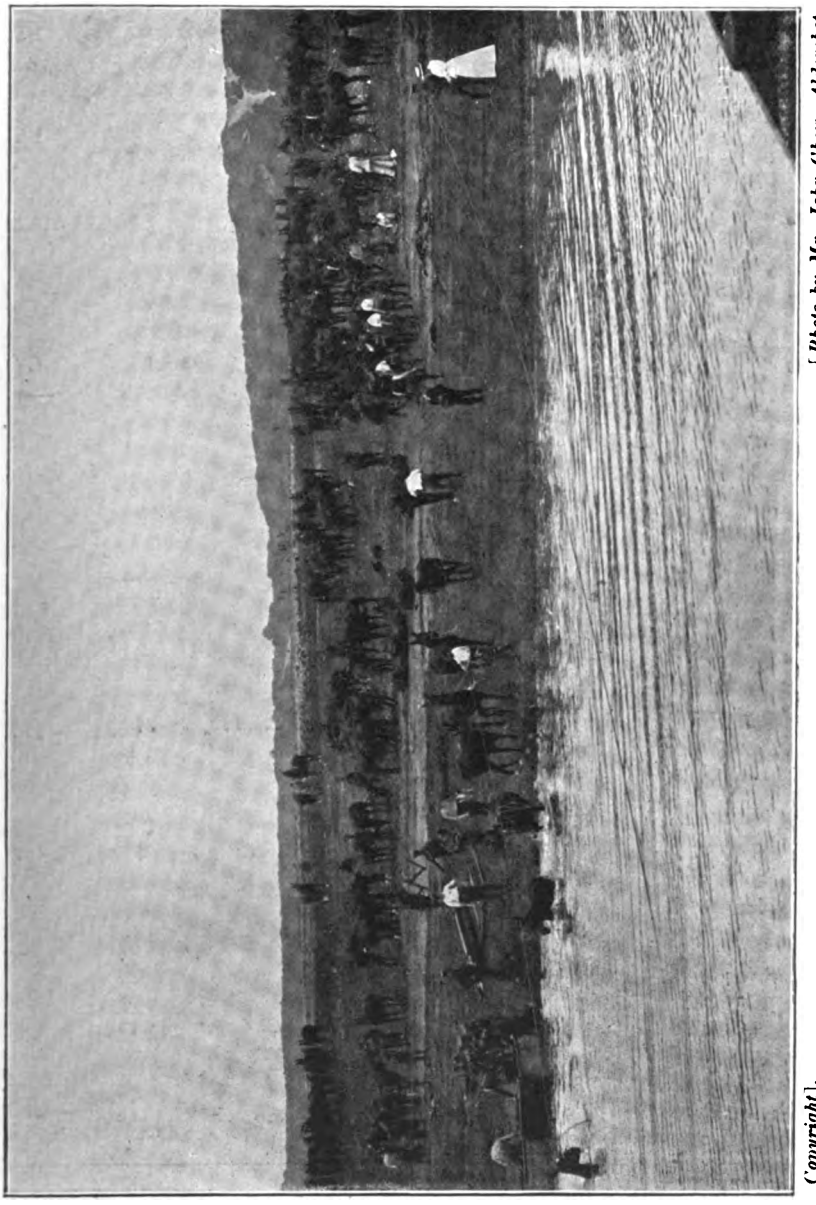
squadron are sent over with as many men as can be spared. On arrival at the opposite bank these men are divided into three bodies, (1) those to pull on the endless rope, (2) those to receive the horses



[Photo by Mr. John Chew, Aldershot. (Copyright.]

and cast off the head rope from the endless rope, (3) those to collect the horses and hold them till all are across. It is most important that the men pulling the endless rope should do so hand over hand, and as quickly as they possibly can, for they will find that the horses

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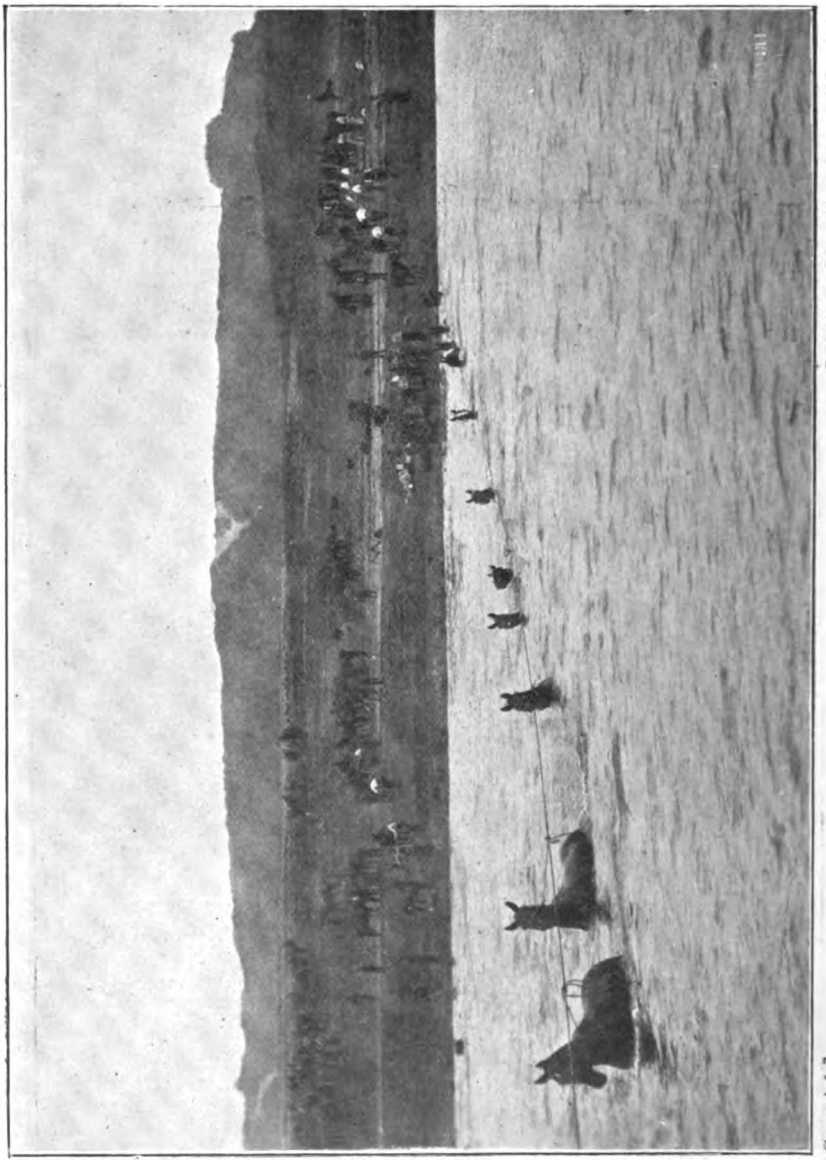
will always begin by swimming faster than they can pull, and this will often result in the horses being upset backwards and possibly in their being drowned The men receiving the horses must each



[Photo by Mr. John Chew, Aldershot.

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have a clasp knife open and ready to cut the head rope should the knot be too securely tied.

On the starting off side, each horse must be led to the holdfast where it is handed over to a lasher, of whom there should be about four specially trained men. On the manner in which these men do.

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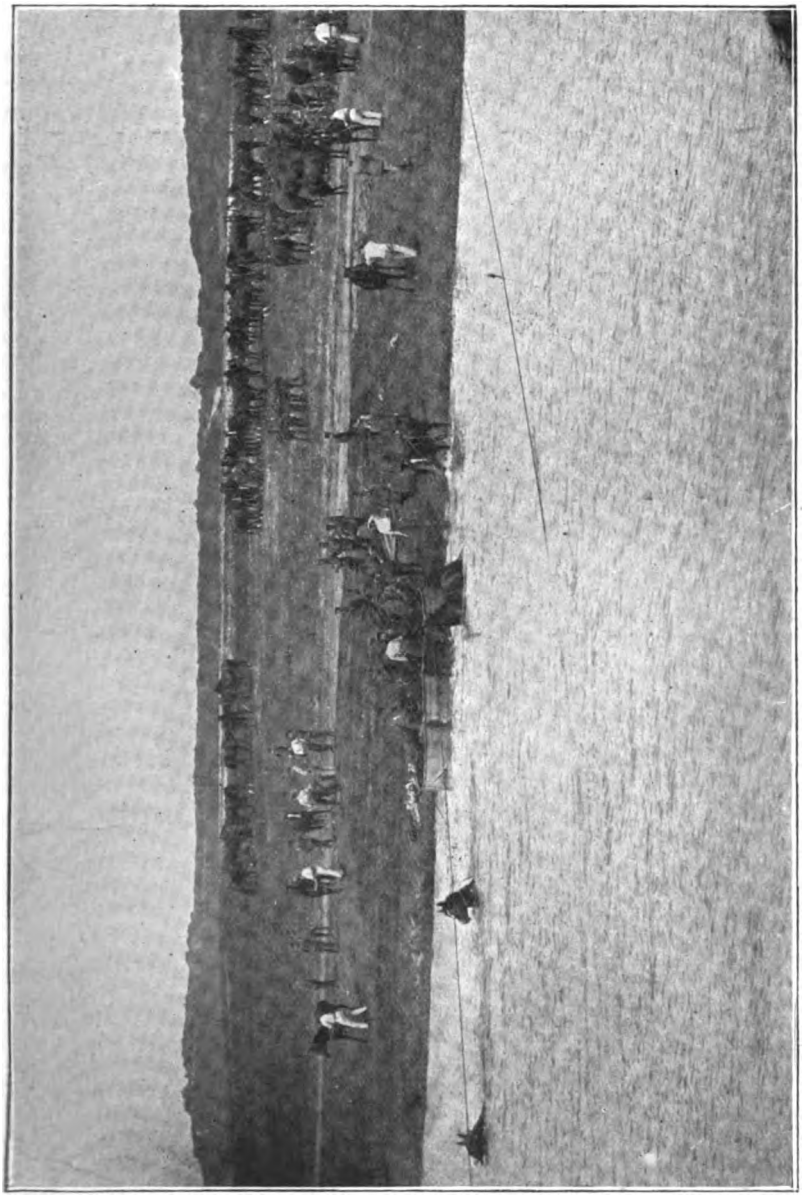
their work depends the rapidity and success of the passage. Each lasher, walking backwards towards the bank, ties the head rope on to the endless rope with a double clove hitch and slip knot, so that



[Photo by Mr. John Chew, Aldershot.

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the receiver can easily, by pulling on the end of the head rope free it from the endless rope. The distance from the horse's head to the endless rope must not be more than eighteen inches. The horses are tied on at intervals of about two horses lengths, and care must

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be taken that the head rope is tight round the endless rope, as otherwise, should a horse not like to go into the water, he will get back against the next one following him, these two may then damage one another while swimming, and there may be difficulty in untying the knots on the landing side. It is most important that the endless rope should be kept moving the whole time, for it must be remembered that there are generally about twelve to fifteen horses in the water at the same time, all tied to a rope, and that they will continue swimming whether the rope is moving or not, consequently, if the rope remains stationary they will upset themselves and probably be drowned. On the landing side there should be four receivers with open clasp knives, six men ready to take the horses as soon as they are untied off the rope, and from twenty to thirty men to pull on the endless rope. Thus should a receiver find a knot jammed, he will instantly cut the head rope before it reaches the first block on the landing side. The time taken in getting 125 horses across the cavalry swimming pond on two endless ropes was about eight minutes.

All the cavalry regiments and Horse Artillery batteries had done their three days practice by the end of July, and on August 1st, General Byng ordered the three cavalry regiments, and two guns and two wagons with as many mounted men as possible from each battery, to parade at 7.45 p.m. At that hour we were informed that we were supposed to be going to make a raid N. of the Thames, crossing that river above Windsor, where the bridge was supposed to have been destroyed. We marched *via* Ascot, and arrived at 2.15 a.m. August 2nd at the Windsor race course. There the Engineers had put up a number of endless ropes and a landing stage from which to embark the vehicles on one bank and another on the other bank to disembark them. The R.H.A. proceeded at once to pass their guns and wagons across, and just as it was getting daylight the cavalry regiments began swimming their horses across, then the Horse Artillery horses were swum across. A small bridge had to be made across a dyke on the Eton side to pass the guns, &c., on to the road, this caused a little delay, but the whole passage of the river only occupied two and a half hours. The vehicles took one and a half hours, the horses had been waiting on the landing side some time before the vehicles were across. We then marched through Eton and Windsor and Windsor Park to Ascot where we arrived and breakfasted at 8.15 a.m. We remained there until 10.30 a.m. and were back in our barracks by 1.15 p.m., having covered close on fifty miles and made the passage of the Thames at Athens, in 17¼ hours without doing any damage and without any accident to horse or man. I think this proves General Byng's method of swimming horses to be infinitely superior to any other. Of it Sir John French says in his remarks on the training of the Aldershot command, "The swimming of the Thames by night by the whole brigade (cavalry) in a wonderfully short space of time was an almost unique performance."

I enclose four photographs taken by Mr. John Chew of Aldershot, who has very kindly allowed me to publish them. They are copyrighted, but they may give a better idea of the arrangements than my description does.

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Battery Drills and Ranging Exercises with Puffs.

By CAPTAIN M. H. C. BIRD, R.G.A.

IT appears to be assumed that when using puffs to indicate the position of shell-bursts it is necessary to fire them in accordance with a pre-arranged scheme; by so doing, the B.C. is deprived of all practice except that obtained by working out the scheme beforehand. This can be remedied by firing the puffs in accordance with the corrections given by the B.C. There is no difficulty in doing so, as communication always has to be established between the range party and the battery in any case.

The range officer (or N.C.O.) should be told what the range is, and should be allowed to fix on a reasonable "error of the day," say up to 10% of the range, an amount which is not likely to be exceeded, but which, I believe, may occasionally be met with on the Continent in summer. Suppose the actual range to be 5,600 and error of the day—100, a round fired at 5,400 would be answered by a puff at 5,300, or 300 short, a round fired at 5,700 would be answered by a puff at 5,600, or "range," and so on. To facilitate matters, pegs should be put out in the line of fire at intervals of 25 yards for guns, and numbered, and then, on the range being ordered by B.C., it is signalled to the range party who get ready a puff at the proper peg, when the gun is fired "F" is sent, and after the time of flight has elapsed the puff is fired.

In the case of howitzers the pegs should be put out at an interval equal to the probable error at the range, the "range" peg being marked with the elevation corresponding to the range + or — the error of day. This corresponds to the instructions for ranging on p. 133 "Garrison Artillery Training," Vol. II. The range officer should have a table or simple diagram shewing the pegs corresponding to the different elevations.

From this it is but a very short step to a very realistic procedure which consists in not firing the puffs at the actual point corresponding to the correction given, but at a point determined in accordance with the laws of probability. For the sake of simplicity it may be assumed that the variation in the fall of shot will always be a multiple of the probable variation, that is to say, rounds may be taken to fall either at the point aimed at, or at a distance from it equal to once, twice, three or four times the probable variation. Out of 100 rounds the numbers may be taken approximately as "range" —26, +1 (times prob. var.) —21, —1 ...21, +2 ... 11, —2 ... 11, +3 ... 4, —3 ... 4,

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+4 ... 1, −4 ... 1. The range officer is supplied with a bag containing 100 counters of sorts, of which 26 are marked 0, 21 are +1, 21 −1, 11 +2, 11 −2, 4 +3, 4 −3, 1 +4, 1 −4. When an elevation is sent in, the range officer first determines the peg corresponding to it, then draws a number from the bag and increases or shortens the range by the number of pegs on the counter. 20 pegs would usually suffice, and they should for convenience be numbered from 1 to 20, 10 being at "range" and 1 nearest the battery. In putting out the pegs the most convenient way is to plant No. 10 first, as is done for siege practice. In the case of guns, when the range + or − the error of day does not come to a number that can be set on the sights, No. 10 peg is planted at the nearest 25 in front of or behind the "range" point.

If the ground slopes considerably at the target this should be allowed for in putting out the pegs, and if there is much irregularity as in the case of a target battery or fort it is simplest to draw a section of it on squared paper, draw a horizontal line through the ranging point, mark off on it the positions of the pegs, draw lines through these points at an angle with the horizontal equal to the angle of arrival, and plant the pegs at the points where these lines cut the section.

If it is desired to introduce variations in shooting between individual guns it can easily be done by signalling the number of the gun to be fired to the range party, the range officer can then give a permanent gun error to one or more of the guns for any series.

In the following examples, the numbers in column 4 were actually drawn.

EXAMPLES. SERIES NO. 1.

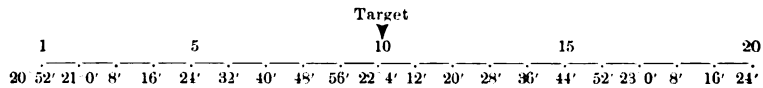
6" B.L. Howitzer, Mk. I. Full charge. Projectile 100 lb. (Range Table provisional 1905).

Actual range 5,200. Error of day −150. Corrected range 5,350.

Elevation for 5,350, 22° 4′.

50% Zone at 5,200 = 44·7 yds. Probable var. 22·35 yds = 67 feet corresponding to 8′ mins. difference in elevation.

Pegs planted at 22⅓ yards interval.



Round.	Elevation.	Peg.	Variation drawn.	Puff at Peg	Result at yds.	
1	21° 10′	3	+2	5	−111⅔	
2	22° 30′	13	0	13	+ 67	
3	21° 50′	8	0	8	− 44⅔	
4	22° 10′	11	0	11	+ 22⅓	short bracket 20′
5	22° 0′	9½*	0	9½	− 11⅓	
6	22° 0′	9½	0	9½	− 11⅓	
7	22° 0′	9½	0	9½	− 11⅓	
8	22° 10′	11	+2	13	+ 67	
9	22° 10′	11	0	11	+ 22⅓	

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10	22°	10′	11	−2	9	− 22⅓
11	22°	10′	11	+1	12	+ 44⅔
12	22°	5′	10	+1	11	+ 22⅓
13	22°	5′	10	+3	13	+ 67
14	22°	5′	10	0	10	+ 0
15	22°	5′	10	+1	11	+ 22⅓
16	22°	5′	10	+1	11	+ 22⅓
17	22°	5′	10	−1	9	− 22⅓
18	22°	5′	10	−1	9	− 22⅓
19	22°	5′	10	−4	6	− 89⅓
20	22°	5′	10	+2	12	+ 44⅔
21			10	−1	9	− 22⅓
22			10	−3	7	− 67
23			10	0	10	± 0

The above is a specimen of the form that should be kept by range officer, and handed in afterwards as a check on the observation.

EXAMPLE II. (XVI. IN G.A.T., VOL. II.).

Round.	Elevation.	Peg.	Variation Drawn.	Puff peg.	Result.
1	16° 30′	—	+4	2	−256
	17° 30′	5⅓*	0	5⅓*	−150*
	17° 30′	5⅓	+1	6⅓	−118
	18° 30′	13⅓	+1	14⅓	+138
	17° 50′	8	−4	4	−192
	18° 10′	10⅔	0	10⅔	+ 20
	18°	9⅓	−3	6⅓	−118
	18°	9⅓	−1	8⅓	− 54
	18° 5′	10	−1	9	− 32
	18° 5′	10	−2	8	− 64
	18° 5′	10	0	10	± 0

50% zone 9,150 yds. (18° 5′) 64 yds. Prob. var. 32. Pegs at 32 yds. interval corresponding to 7½ mins. (10′ = 44 yds.).

288	−256	−224	−192	−160	−128	−96	−64	−32	± 9150	+32	+64	+96	+128	+160	+192	+224	+256	+288	+310
1				5					10					15					20
17° 5′		20′			35′			50′		18° 5′		20′		35′		50′		19° 5′	19° 20′

It is of course necessary for the range officer to know each time what means of giving elevation and, in case of howitzers, what charge is to be used.

This system appears to be the one followed in the Austrian Siege Artillery, and is fully described in "Mitteilungen über Gegenstände des Artillerie- und Geniewesens," No. 4, 1906. One great advantage is that the whole of the battery drill, training of B.C., observers, &c., can be gone through without taking the guns out, which enables one to use land that would otherwise not be at one's disposal. I have, therefore, thought is desirable to bring the matter to the notice of the Regiment at large. The saving of ammunition must be considerable, as ranging can be taught properly with puffs by this means.

* Half-way between 9 and 10.
* Fired 10 yds. nearer target than peg 5.

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A System of Messing suitable for a Brigade of Artillery.

By CAPTAIN C. C. ROBERTSON, R.F.A.

THE following system of messing has been tried and found satisfactory. The principle observed is that the control of the messing should be in the hands of the battery commanders, and that due advantage be taken of the expert knowledge of the master cook.

Battery commanders deal directly with the master cook, in order to get full value of his training and experience.

Diet sheets:—

The master cook prepares, and submits to battery commanders for approval, the battery diet sheets for each week.

Grocery slips:—

After approval of diet sheets, the master cook makes out the grocery slips for the ingredients actually required.

Messing book:—

The messing book remains in the hands of the battery commander.

Meat issue:—

The meat ration is drawn in bulk for the whole brigade. The master cook attends the issue of meat, and selects the joints most suitable for roasts, pies, and stews; to be approved by the orderly officer. Batteries are put on "roasts" in turn.

Battery cooks:—

Battery cooks are put through a course of cookery, and extra pay allowed to men employed in this capacity. This to be given only to cooks who are reported on satisfactorily by the School of Cookery; or who are already fully competent in their duties.

Assistant master cook:—

Each qualified battery cook is on duty for a month in turn as assistant master cook.

This system involves no radical changes. It can be taken up or discarded without any dislocation of routine.

Master cooks:—

The importance attached to the position of master cook in a brigade of artillery has recently been emphasised by the grant to them of pay equal to that of a serjeant plus extra duty pay at 6d. per day.

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This offers great inducement to young N.C.O's to qualify for the appointment. The position is one of responsibility, and the success of any system of brigade messing must depend mainly on the energy and resource of the master cook; especially as regards the variation of the mens' diet.

The preparation of diet sheets and grocery slips should be entirely the province of the master cook. It is essential that his experience be utilised in this respect. And it is not fair on him to have the preparation of dinners for which the requisite ingredients are not forthcoming; or for which, on the other hand, ingredients may have been ordered in excess of requirements. The one case means a bad dinner, and the other leads to waste.

It must be understood that the scale of ingredients set forth at the commencement of the messing book is only a guide—an excellent guide, certainly—but not intended to supersede expert knowledge.

The preparation of diet sheets is frequently left to N.C.O's who have absolutely no knowledge of cookery and the relative food values. This leads to a badly balanced diet. On certain days, for instance, an excess of bread stuffs will be put on the table, such as meat puddings, followed by treacle puddings. Or the diet may show rice puddings following a curry and rice meat course. Or a vegetable stew may be preceded by a pea and lentil soup. The result is waste, since men will naturally refuse a diet which is not well balanced.

If, however, the dishes are properly distributed throughout the week according to their peculiar food values, this waste does not occur. The men eat better, and are in better health. But this cannot be secured without the scientific appreciation of food values, which the master cooks are taught at the School of Cookery.

A time table setting forth the duties of a master cook and his subordinates is appended. It serves as a useful guide and is capable of any necessary modification. It is compiled in accordance with the methods observed at the School of Cookery, Aldershot. Certain definite days and hours are allotted to the various kitchen duties. It is a mistake to have a sort of weekly spring cleaning. The work should be apportioned daily.

Battery cooks:—

The training of battery cooks at the School of Cookery,[1] should be secured when possible. It is neccessary to attract a specially good class of man for this work. Not long ago the idea was common enough that any man not sufficiently intelligent as a gunner would do for the kitchen. This fallacy cannot be too strongly condemned. Instead of stupidity, it is intelligence that is specially demanded of a battery cook. Men should be selected for their cleanliness, smartness, and sobriety. The health and contentment of the personnel of a battery are enormously affected by the care and skill bestowed on the cooking.

[1] By a recent War Office circular batteries at stations where no master cook is available for training battery cooks can send men to School of Cookery, Aldershot. Application for vacancies should be made to the Staff Officer in charge.

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A case that occurred quite recently (not in the regiment) illustrates the lack of appreciation in certain corps, of the qualifications necessary for a soldier cook.

Serjeant to recruit recently posted from dèpôt: "You are to relieve Simpson in the cookhouse, there's the diet sheet, its meat pies."

Recruit: "Serjeant, I have'nt done no cooking in my life, and I don't know how to make a meat pie."

Serjeant: "That don't matter; you *get on with it*!"

It is worthy of remark that this casual treatment of the question was by no means uncommon in very recent years, and is solely due to ignorance. It still crops up occasionally.

The master cook is sometimes greatly handicapped through want of consideration in having the battery cooks and their assistants frequently taken away, and other men substituted. The work to be done has all to be learnt afresh. The assistant battery cook should not be changed, as the battery cook's time and attention are taken up in looking after an incompetent successor.

The unpopularity that sometimes attaches to the position of cook can be speedily overcome by recognition of the special qualities necessary in selection, and the encouragement of men so employed by the grant of extra pay and privileges.

Meat issue:—

The system of pooling the meat is of great assistance in the cooking. Each battery in turn secures the best roasting joints. Occasionally the master cook will be able to put a battery and a half on roasts; if for instance he draws a hind quarter of beef, which contains the best roasting joints.

The meat which is not suitable for roasting, is issued for stews, pies, &c., to batteries in turn. It is useless to attempt a roast with meat that can only be rendered fit for table by stewing.

In a brigade cookhouse, with three battery kitchens, it is an advantage to have one kitchen daily for roasts, another for stews, and the third for pies, &c. This makes for simplicity, and, therefore, easier supervision. A battery cook does not have his attention divided up between roasts, pies and stews, for different sections.

It will be found convenient for the master cook to present the diet sheets for the following week on each Friday morning. When passed by battery commanders, he makes out the grocery slips, which can be checked on Saturday.

A careful master cook will be able to effect considerable economy in the purchase of ingredients, and the money thus saved can be best spent in improving the breakfasts.

The master cook should be held responsible for the amount of dripping saved, in the proportion of ½ oz. dripping to the ordinary ration of 12 ozs. of meat.

The battery commander retains the control of expenditure, and by dealing directly with the master cook is able to fix the individual responsibility on the whole subject of the messing of his battery.

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Time Table of a Master Cook in charge of the Cooking of a Brigade of Artillery.

DAILY DUTIES.

Time.	Morning.	Time.	Forenoon.	Time.	Afternoon.
5.30	Open cookhouse and see that all fires required for breakfast are lighted.	8.30	Re-open the cook-houses for the cooks to resume work. Superintend the preparation of the Dinner meal giving practical instruction when necessary.	1.45	Re-open the cook-houses, inspect all cooking utensils returned by cook's mates also all steamers, ovens etc., used by the cooks, see they are thoroughly cleaned up and put away in the place set apart for them.
6.0	Issue to cooks articles required for breakfast and dinner.	9.30	Inspect the Stock Pot, see that the bones are broken small, the contents only simmering and that the scum is removed from time to time.	2.30	Take in the groceries for the following day, checking the items carefully.
6.30	Superintend the preparation of puddings and paste for dinner and give any instructions required.	10.0	Inspect the clarified dripping, weigh all dripping made and hand over to the Qr.-Mr. Sergt.	3.0	Prepare bacon, sausages, fish, etc., required for breakfast next morning also fruit, vegetables, etc., for dinner. See that all cooking vessels required for the following day are cleaned, marked and laid out ready for use.
7.30	All fires required for dinner to be lighted. Superintend the receipt of the meat ration recording the weight issued to each mess in the book kept for the purpose.	10.30	Inspect cook-houses to see that they have been properly cleaned especially benches, chopping blocks, sinks, grocery cupboard and floor.	3.30	The flues of the apparatus that has been in use to be cleaned, fires laid, ashpits emptied and boilers filled with water, bones removed from Stock Pot and put in a cool place; No. 3's thrown away.
7.45	Send breakfast away and close cook-house to enable the cooks to have their breakfast.	11.0	Inspect the dishes for dinner pointing out any errors to the cook, see that the joints have been turned, stews stirred and the gravy made.	4.30	Issue fuel for next day and articles required for tea. See the tea meal prepared. Inspect the cook-houses, see that everything is ready for the following day, the windows closed, place cleaned up and that each man is in possession of his detail for the next day's work.
		11.30	See that all green vegetables, rice etc., are made ready for cooking and potatoes placed on the steam. If soup is being prepared the thickening should now be added. Check the contents of the grocery cupboards.		
		12.30	Superintend the dishing up of the dinner meal. See that all liquid fat is removed and the gravy added before the dishes are sent to the barrack rooms. After the removal of the dinners wait until the Orderly Officer has completed his rounds, then close the kitchen for 45 minutes.		

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Battery Cooks duties for Cook-house where 2 Cooks are at work.

DAILY DUTIES.

Time.	Morning.	Time.	Forenoon.	Time.	Afternoon.
5.30	Light fires required for breakfast, open windows.	8.30	Prepare the dinner also soup if required.	1.30	Take in all cooking vessels, seeing that they are clean. Thoroughly scrub all steamers and spare cooking vessels with soap and soda and dry well out, place them in a dry place, clean and replace all utensils used, clean and dry the floor, clean out the stoves not in use, empty the ash-pits and fire places, laying the fires for the following morning. Fill the boilers with water required.
6.0	Prepare any pudding or paste for dinner.	9.0	Chop the bones, cut up the fat, place the bones in the Stock Pot.		
7 0	Cook the breakfast and prepare the tea or coffee. Received the meat rations and the prepared potatoes required for dinner.	9.30	Clarify the skimmings from the previous day.		
7.30	Light fires required for dinner.	10.0	Scrub the benches, tables, utensils, floor and sink.		
7.45	Send breakfast away. Close kitchen for 30 minutes. The cooks will take turns in lighting the fires, the one off duty should be in the kitchen not later than 7 a.m. The cook on duty should be held responsible for the cooking of the food for the unit for the day. One cook only is required for duty in the afternoon. This will allow each cook to have every alternate afternoon off duty. It must be understood that the above duties should be divided between the men so that each man may know what he has to do. The division of work should be carried out by the Master Cook.	10.30	Clean all steel work and grocery cupboard.	2.30	Receive all groceries for next day, prepare all bacon, sausages, fish, etc., for breakfast, clean and prepare vegetables, etc. Mix all the dry ingredients for puddings, clarify any dripping. Remove the bones from the Stock, throw away No. 3, place the other bones in a cool place. Get all dishes ready for the following day.
		11.0	Examine the meat, turn the joints, stir the stews, make the gravy.		
		11 30	Place potatoes on the steam to be cooked.		
		12.30	Dish up the dinners, remove the liquid fat, pour over the gravy.		
		12.45	Send dinners up. Close the kitchen for 45 minutes.	4.30	Prepare the tea meal.
				5 0	Close the kitchen.

SPECIAL DUTIES.

Monday.	Sweep the walls.	White wash the walls at the bottom and above all boilers and ovens.	Polish steamers and tin ware with whiting. All flues to be cleaned out.
Tuesday.	Scrub down the tops of the boiler.	Clean out all sink traps with boiling water.	Empty and thoroughly clean out the boiler used as a Stock Pot.
Wednesday	Sweep the walls.	Thoroughly overhaul all spare utensils.	Scrub the handles of all brooms, mops, etc. Wash pudding cloths and vegetable nets. All flues to be cleaned out.
Thursday.	Scrub the frames and tops of boilers.	White wash all walls as high as possible.	Scrub out the inside of the ovens.
Friday.	Thoroughly cleanse floor immediately in front of the ovens and boilers.	Thoroughly cleanse all grocery cupboards.	Clean the windows. All flues to be Cleaned out.
Saturday.	Make a list of articles requiring changing and any Engineer repairs. Scrub handles of brooms etc.	Clean and white wash bottom of walls.	Overhaul the buckets, dishes, etc.

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There should be a cook and assistant cook in each cookhouse. The duties of these men should be divided, each man being held responsible for the cleanliness of certain parts of the cookhouse. The cook on duty for the day should report for work at 5.30 a.m., and leave at 2.30 p.m. The cook off duty should report at 7 a.m., and leave after the tea meal has been served. The cleaning duties should be changed weekly. The cook on duty will be responsible for the cooking until the dinner hour. The cook off duty will prepare the breakfast and tea meals, assist in preparing the dinner, make the dripping and look after the Stock Pot. He will also attend to any special duties that may require doing during the afternoon.

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A few Remarks on Major J. G. Geddes Methods of Estimating Displacement, &c.

By MAJOR A. T. ANDERSON, R.F.A.

IN the two papers on the above subject published in the "Journal of the Royal Artillery," February, 1907 and September, 1907, respectively, Major Geddes has explained in a very lucid manner a method of obtaining the line of fire by using the table of displacement differences, and a system for estimating displacement.

Much that he has written in the first paper appears to me most useful and suggestive, and his system for estimating displacement, in conjunction with the rough rule of multiplying the number of "bumps" at the trot by three (at the canter I think it better to multiply the number of bounds by *four*) works out in practice with remarkable accuracy. But I cannot see that any time is saved by finding out the displacement difference, when we already have a plotter to do the work for us. Whether we use a plotter or not, the range from the observer to the target (DT), and the angle between the target and the battery director (BDT) must be taken; the saving of time in Major Geddes' system is effected by estimating the base (DB) instead of taking it by the range takers; that done, why not do the rest of the calculation automatically with the plotter Surely it is quicker, and less likely to admit of personal error, to set a plotter and read off the result, than to perform even such small calculations as are involved in subtracting the angle TDB from 180°, and then subtracting from that result another angle, to find which reference must first be made to a table of displacement differences.

I assume that the plotter is available, as it almost invariably would be; otherwise the table of differences would undoubtedly be useful.

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The co-operation of the Navy and Army in War as promoted by the Naval War Course.

By COLONEL H. C. C. D. SIMPSON, C.M.G., R.A.

IN a paper in the November number of the "R.A. Journal," Colonel Abdy gives us some interesting details in connection with the Senior Officers' Course at Hythe, in which he includes some remarks, which put the methods in vogue at Okehampton in a rather unfavourable light.

I think his experiences at the latter school must have been exceptional. I had the prividege this summer of attending a course at Okehampton in Field Artillery Fire Discipline, which covered the period during which the Senior Officers' Course of all arms was being conducted. We certainly all had practically the undivided attention of the present Chief Instructor, and were permitted to witness the practice in the immediate neighbourhood of the batteries. If one bears in mind that the School of Musketry is practically located in a town, whereas the School of Gunnery at Okehampton is established in a camp on a bleak moor, the accommodation and messing arrangements appear to me to be thoroughly satisfactory.

The object of this paper is not, however, to defend the School of Field Gunnery, doubtless quite capable of looking after itself, but to call the attention of my brother officers to another Senior Officers' Course conducted by the sister service, largely with the object of ensuring in war the effective co-operation of the naval and military services, and attended by both naval and military officers.

This Naval War Course I have sometimes heard likened to that for the army, which is given to the Senior Class at the Staff College, with a percentage of the instruction afforded to military officers at the School of Economics thrown in. This is only partly true, and its object, moreover, is quite different. Whereas the courses referred to for the army are intended mainly to train comparatively junior officers in the duties of the Staff, the Naval War Course instructs senior officers in the methods of commanding large joint bodies of combatants—fleets or land forces—and in the art of administrating civil communities under the provisions of Martial Law.

The importance of officers of the two services working out problems together in peace, has been so constantly impressed upon us of late, that it is scarcely necessary to emphasize the value of joint consideration by them of the following circumstances of war:—

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1. The embarkation, safe conduct across the seas, and disembarkation on a hostile coast of an expeditionary force.

2. Coast defence, and the protection of coaling stations, bases, and harbours of refuge.

3. The capture by a land force of a temporary naval base for the use of our fleets in war.

4. The necessity of resorting to land operations in order to deal with an enemy's fleet taking refuge in harbour.

5. The maritime lines of communication of an army, and the assistance given by the guns of a fleet when these communications run parallel to the coast line.

6. Siege of maritime fortresses.

7. Co-operation in inland or river operations by a naval brigade.

In the foregoing subjects and many additional, each War Course gives instruction to Flag Officers, Captains, Commanders, and a proportion of Naval Lieutenants (over six years service) on half pay, and a limited number of senior Army and two Marine Officers.

Two Courses, each of four months duration, take place during the year at the War Course College, Portsmouth Dockyard, viz. from October to February, and March to June, respectively. My experiences were acquired during the second term of 1906.

The syllabus of instruction embraces the following subjects:—

(a). Playing the tactical and strategical naval war game.

(b). Studying and writing reports and essays on the various amphibious (!) problems arising out of the strategical conditions of the present day.

(c). Lectures on the following:—Imperial Strategy, Naval History, Architecture, Steam and Gunnery, Submarine Warfare, Wireless telegraphy, Coast Defence, Combined Operations of the Navy and Army (Illustrated by a campaign), International Law, Political Economy and Statistics, and the Navies of Foreign Powers.

(d). Staff Ride with Officers of the Staff College in a combined Naval and Military operation; and visits to various naval establishments and ships, to witness certain practical operations.

The Lectures are delivered by Naval experts, and gentlemen of all professions who are, in this country, regarded as amongst the leading authorities on their special subjects. These Lectures dealing with Naval and Military Operations and machinery, &c., are well illustrated by lantern slides, which all add much to their value and interest.

The daily work of the Course is as follows:—

Morning. { (a). 10 to 12 (with short interval) Lectures.
(b). 12 to 1 Naval War Game.

Between 1 and 2 an excellent 1/6 lunch is served in the Mess of the Officers of the adjoining Navigation School.

Afternoon. { (a). 2 to 4 working out in theory and practice a problem.

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On Friday at 1 p.m., work is suspended till the following Monday morning. Officers reside in the town of Portsmouth, and the Keppel's Head Hotel, of well-known fame, is a most convenient residence for students.

For the carrying out of the problems referred to, the class which is normally split up into four sections each under a Flag Officer with an Army Officer as military adviser, works in two bodies opposed to each other. The building is divided by means of the Lecture theatre and Library into two blocks. In each block are several rooms, each of which represent the Admiralty, and the positions of the various fleets and fortresses respectively. The body of Officers representing the responsible authorities at these different localities are isolated in these rooms, and are only allowed to communicate with any other body of their own side through the umpires, and only such information is afforded as would be known in war. Communications between one body and another are compelled to cover the intervals of time they would actually take in transit under similar circumstances in war.

When opposing bodies come into contact, the movements are played out on the war game board with great realism. This game is not permitted to be described in detail. Although work is suspended from Friday afternoon to Monday morning, the library of the College is always open for purposes of study. No reasonable expense is spared in procuring books, and Captain Slade has managed to obtain as complete a selection of works, British and Foreign, bearing on the co-ordination of the work of the Navy and Army, as possibly exists in any similar library in the world.

No examination is held in the subjects included in the War Course, except for Lieutenants, R.N. In the case of these latter, a report is made as to the attention and diligence shown by each Officer as tested by examination or otherwise. Officers who receive a favourable report derive certain advantages which it is unnecessary to go into here.

In conclusion I would strongly recommend half-pay Colonels desirous of further employment in the 1st or 2nd line of our Imperial Army, taking advantage of going through this interesting and instructive Course, should opportunity be afforded them. Apart from its professional value, it moreover has the recommendation of bringing Officers of both services into friendly intercourse, and it is to be regretted we have not a similar Course in the Army for Field and General Officers.

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Horse Artillery and Shock Tactics,

By LIEUTENANT H. W. WYNTER. R.H.A.

THE subject of the following essay is one which presents many difficulties, and not very much has been written about it. There are in history very few instances of large bodies of cavalry, reinforced by horse artillery, meeting on equal terms. In the days of Condé and Marlborough, when the most important part of an army was its cavalry, horse artillery was unknown. Neither the Napoleonic or Franco-German Wars are fertile in instances of combats between large units of equally matched cavalry; and the Russo-Japanese War is devoid of them. Nevertheless, the great importance of the part that will be played by the independent cavalry and horse artillery in the future, makes the subject well worth studying. But the paucity of historical examples adds to its difficulty, and the experiences of recent manœuvres show that we have yet much to learn.

In this, as in all other matters, the personal element enters very deeply. If two arms are to work in harmony, each must understand the other's business as if it was his own. Much has been done in this direction of late years by the attachment of officers to other branches of the service. But the peculiar conditions of their work render it more necessary that there should be complete harmony between the horse gunner and the cavalryman than between any other two branches of the service. We have too long been content to go on working each on our own lines, very diligently perhaps, but in total disregard of the other arms, and with sorrow be it said, that in this respect the gunner is perhaps the worst offender. Prince Kraft in his "Letters on Artillery," says that artillerymen were much too prone to regard themselves as wizards, and despise what they regarded as the non-scientific branches of the service. The same criticism is applicable to-day. The artilleryman rightly develops the science of his arm and perfects his methods, but too often does so without thought as to their suitability for co-operation with cavalry and infantry. It is impossible to lay too much stress on the fact that artillery is at all times an auxiliary arm. The horse artilleryman who wishes to act successfully with cavalry must thoroughly understand cavalry methods, and to a great extent subordinate to them his own theories as a gunner.

It is here that the personal element becomes so very important. Men who are well acquainted with one another, and on friendly terms must act more harmoniously than those who are strangers or antipathetic. It is only by the cultivation of personal sympathy that it is possible to eliminate the habit among subordinate leaders of slavish and even disloyal adherence to the letter, rather than the spirit of an order, which has wrecked the chances of so many Commanders; the decentralization of command is far greater now than formerly. In treating this subject, therefore, the artillery officer should try to

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adapt artillery theories to cavalry practice, in accordance with the principles which govern the latter.

The functions of cavalry may be shortly summarized as follows:—

1. Strategic reconnaissance.
2. Screening and protection.
3. Operations in conjunction with the other arms during a general action, in pursuit and in retreat.

It is accepted as a general principle that horse artillery is necessary to cavalry acting in masses, though opinion differs as to the extent of its sphere of usefulness. From a tactical point of view, cavalry have a two-fold rôle—fire action and shock action, dismounted and mounted. General von Bernhardi in his book, "Cavalry in future wars," says that cavalry must needs have daily recourse to firearms. The less open the country and the nearer the enemy's main body, the more often will this be the case, and on such occasions the assistance of artillery is quite indispensable. But he insists, quite rightly, that we are in danger of forgetting that the first aim and object of cavalry is the destruction of the enemy's horsemen by means of shock action. In this, too, guns can play their part, though authorities differ as to its importance.

When cavalry is acting dismounted, the procedure of the horse artillery does not differ essentially from that of field batteries in support of infantry, and the writer does not propose to discuss it. He intends to consider the application of fire of horse artillery with a cavalry force that is manœuvring for shock action. The term application of fire includes fire discipline, fire tactics, and may be considered to include manœuvre, though the latter comes under a different heading in the " Field Artillery Training."

Taking the various functions of cavalry in order, we come first to the " Strategic reconnaissance."

It is generally recognised that all large armies must possess an adequate force of cavalry which can be used solely for the purpose of clearing up the strategic situation, by the defeat of the enemy's cavalry. This force must be quite independent of the duty known as " screening," which can be carried out by mounted brigades or yeomanry, in default of cavalry. This strategic cavalry, though frequently obliged to fight dismounted, will seek to gain its end by shock action, provided the country be reasonably open and the enemy's cavalry not greatly superior in strength or training.

In regard to the second function of cavalry, the "screen" would no doubt be provided with guns if it possessed sufficient numerical strength, but their value would be strategical rather than tactical. Moreover, as such a force might well be composed of mounted infantry or yeomanry who are not trained for shock tactics, the action of their artillery does not concern us. Similarly when the cavalry is co-operating with the other arms in the decisive battle, it is laid down as a principle by so eminent an authority as General von Bernhardi, that the "artillery reinforcement" of cavalry masses "should not be expended eccentrically, but utilised to the uttermost in the most decisive direction on the battle field itself." i.e., it would for the most part be used merely as mobile field artillery, not nec-

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essarily under the orders of the cavalry commander. On the other hand, he considers that in pursuit or in retreat, the strategical cavalry should again be reinforced as far as possible with guns, and pleads for a greater elasticity of organisation to make these variations possible. This principle of elasticity no doubt inspired the change in our own organisation at the beginning of 1907, by which four batteries are allotted as divisional troops, instead of one being tied to each brigade.

It is in the strategical rather than the tactical pursuit that artillery will be required to assist, and in this case, as in the protection of a retreat, the action of cavalry will be for the most part dismounted. It is obvious, therefore, that horse artillery will most often be required to act in the circumstances under discussion, when they form part of the independent cavalry force employed in front of an army for the purpose of strategic reconnaissance.

It has been stated above that authorities differ as to the practical value of guns in a mounted combat. General von Bernhardi says (if I may be forgiven for quoting him again) "it is impossible to assign a decisive importance to the participation of a few horse batteries in the actual shock of the opposing squadrons." But he admits that "one should always do one's best to use to the utmost such artillery power as is available, and particularly if . . . . we have reason to suppose the enemy possesses a marked numerical superiority." It must be remembered, however, that the General is a cavalry officer, and at the time he wrote the Germans had no Q.F. gun. It should be the ambition of all gunners to develop the power and rapidity of their fire to the utmost, and prove that such theories are unjustifiable.

The normal procedure of cavalry manœuvring to attack by shock action is described in chapter VII. of "Cavalry Training." When within striking distance of the enemy the force concentrates for the "approach march," and it is then that the distinctive task of the horse artillery begins.

It is needless to state that the artillery commander, whether he be the Major commanding a battery, the Colonel commanding a brigade, or some officer of higher rank, must be at the side of the cavalry leader during these preliminary manœuvres. Nothing can be more futile than a leader who remains glued to his own command. Von Bernhardi recommends that even in a large cavalry division, regimental commanders should stay with the commander in chief if possible until the last minute, and endeavour to see the situation through his eyes. In a force containing two or more batteries, it seems equally desirable that the battery commanders should likewise be with their Colonels at the General's side. It may be added here that as there will seldom be time for much explanation of the cavalry commander's plans, it is just as important that a horse artilleryman should be accustomed, by his previous training, to grasp instinctively what is in his leader's mind, as it is for the leaders of regiments and squadrons. The "Cavalry Training," states that during the approach march, the "artillery would move massed on the flank of the cavalry." Presumably this would be the inner or protected flank, on which it would subsequently fight. It should be near or at the head of the column, so that nothing will delay its advance into action at the

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psychological moment. It is not unusual during manœuvres for artillery to be put in rear of a brigade or divisional mass, when within striking distance of the enemy. This would seem the worst possible position for it. For in the first place the guns must disengage to a flank before moving into action; secondly, it is not improbable that their advance would hamper, or be hampered by, the deployment of the cavalry, and lastly, they would not as a rule open fire until the cavalry had begun to advance, in other words, till too late. It may here be remarked parenthetically that it is most important that batteries should not be involved in the manœuvres for reduction of front or the opposite entailed on the cavalry by the nature of ground or other considerations. The strain put upon draught horses by the necessity for "keeping station," to use a naval term, in such movements is very heavy, and the batteries should, therefore, be allowed to conform generally to them. A forward position in the advance facilitates this. For reasons which will appear hereafter, it is of the greatest importance that the guns should anticipate those of the enemy in coming into action, and this advantage may be forfeited by delay.

It is, therefore, clearly desirable that guns should be well to the front, and have full freedom of movement, but on the other hand this principle can easily be carried too far. The horse artillery must never forget that "the guns and the cavalry form one organism," and that in a cavalry fight although it is their duty to prepare the way for the attack as well as circumstances will permit, yet purely artillery considerations should give way to those which are expedient for the object in view, that is to say, the defeat of the enemy by shock and not by fire superiority.

In his anxiety to gain time for ranging or for other artillery reasons, the commander of the guns may put them too far to the front, and by opening fire prematurely, disclose the intentions of the cavalry leader, and also allow the enemy to manœuvre to the flank out of the field of effective fire.

If the artillery moves too far to a flank, it exposes itself to attack, and makes a special escort necessary, which weakens the main body. Moreover, it runs the risk of becoming a pivot, and so hampering the freedom of action of the cavalry. Here again the opinion of General von Bernhardi is interesting and valuable, though it is not necessarily indisputable. In treating of the tactical use of artillery he says, "If we admit that in general, as between two great masses of cavalry in actual collision, the guns can play an important part, I must yet insist that the measure of this importance should not be over drawn . . . . As soon as the cavalry begins to advance the part the artillery has to play drops into the background. Then the guns become simply an impediment, because since they generally require a special escort, they subtract from the total force available for the actual shock, and always act more or less as a pivot, which hampers the free movement of the cavalry . . . . The artillery must adapt itself unconditionally to the movements of the cavalry . . . . so as to dispense if possible with the use of an escort."

In the "Cavalry Training," we find the following laid down, "the artillery must not be glued to the cavalry, but must be detached at the

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right moment or perhaps as a rule it is easier to detach the cavalry." This "right moment" must be decided on by the cavalry commander with the assistance of his C.R.A. But the exact moment for coming into action and opening fire must be determined by the artillery commander alone. The cavalry leader cannot do much more than communicate his intentions, and indicate generally the position he wishes to be occupied by his guns.

The underlying principle seems to be that, as guns become very inert once they are in action, they should not be committed until the enemy has showed signs of the line on which he is going to deploy for the fight. At the same time no opportunity should be lost of firing at him while he is still *en masse*, if within effective range.

Colonel J. P. DuCane, R.F.A., in a lecture delivered to the officers of the 1st Cavalry Brigade, lays down the following principles for the conduct of a cavalry engagement. (1) "Always endeavour to bring off your attack on the enemy's cavalry at right angles to the line of fire of your guns. (2) Have your guns well to the front in your manœuvre formations and separate them early from the cavalry." This is a different view from that of General von Bernhardi, who, as previously stated, is inclined to undervalue the assistance of horse artillery, but it does not conflict with what has just been said as to not committing the artillery too early.

A position from which enfilade fire may be brought to bear is, of course, desirable, but its possibilities are limited by the danger of too great separation from the main body. Protection from attack afforded by the nature of the ground is also an important consideration, because it minimises the necessity for an escort. These, however, are ideal conditions which will hardly ever occur together, and seldom singly. The judgment of the artillery commander must determine the position most suited to the tactical situation as it appears to the mind of his leader, and the training of the horse artilleryman must be such that decisions are arrived at by intuition rather than by deliberation, for which there will never be time.

Such are the main principles which govern the conduct of artillery in the cavalry fight up to the moment of impact, and it remains to apply them to the training and discipline.

In chapter VII. (Sec. 88) of the "Field Artillery Training," there are instructions for the guidance of horse artillery acting with cavalry.

During the "approach march" it is recommended that the position of the horse artillery be on a flank or in rear of the leading brigade. But for reasons given above, it appears undesirable that in open country, guns should, under these circumstances, be in rear of anything. Mass, would appear to be the most suitable formation, or line of masses at close interval, (corresponding to brigade mass for cavalry), if there is more than one horse artillery brigade, a contingency which is hardly likely in the English army as at present constituted. Line of battery columns is a very clumsy formation, and should not be resorted to before it is absolutely necessary.

It is probable, as stated previously, that brigade and battery commanders will be with or near the cavalry leader as long as possible before the development of the fight, so as to see with his eyes and

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minimise the necessity for explanation and transmission of orders, which is difficult and even futile when the tactical situation is changing momentarily.

At this period the cavalry is lead by a Staff Officer, or in case of a single brigade by the brigade Major, and the guns under the senior subalterns, as brigade leaders must conform to their movements.

When the artillery is finally separated from the cavalry, just previous to the combat, the advance into the selected position must be as rapid as possible. This position may be one of readiness, or the actual firing position according to circumstances. During this movement, the brigade would be best led by its Adjutant, so as to give the battery commanders as much time as possible for reconnaissance. On occasions of this sort, battery commanders could easily dispense with the heterogeneous mass of signallers, &c., which usually follows them; the trumpeter and Serjeant Major only would be necessary. The Colonel's Staff can also be reduced to the utmost; if the battery commanders are with him, orderlies from the batteries are unnecessary until the brigade is in action, but a channel of communication with the cavalry commander should be provided.

It must be kept in mind that the initiative in opening fire is of great importance. The artillery which obtains it takes the law into his own hands, and the fact of its opening a heavy fire on the enemy's cavalry will perhaps draw on itself the fire of the enemy's guns and thus obtain greater freedom for its cavalry.

It is difficult to imagine circumstances under which there would be an opportunity for fire lasting more than three or four minutes, and this might be diminished by the nature of the ground over which the target was moving. It is, therefore, obvious that even with a Q.F. gun it is of the most vital importance that the time occupied by the advance and by coming into action should be economised to the utmost, so that the greatest possible intensity of fire may be developed in the short time that elapses before it is masked by the impact of the two bodies of cavalry. For this reason it may be necessary for fractions of batteries or brigades to come into action without waiting for the rear of the column, if the approach to the position is narrow.

These objects can only be obtained by a very high standard of training indeed on the part of all ranks. In spite of General von Bernhardi's scepticism, there is no doubt that this pitch of efficiency can, and must be reached.

Concealment and precision of movement must, if necessary, be sacrificed to rapidity. But the consequent difficulty of obtaining accurate fire will be modified by the fact that the targets though moving rapidly will be large and at comparatively short ranges.

With the advance into action, the important question of fire discipline is opened up.

The first difficulty that presents itself is the delay in coming into action caused by the existing system of ammunition supply. The unhooking of wagon horses is always rather a slow proceeding, liable to be made even slower by the restiveness of one horse, and occupies the time of the wheel driver and two gunners. When the wagon is unhooked it is put in such a position that its limber hampers the

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traversing of the gun to the left front, which is a serious disadvantage with rapidly moving targets at close ranges. When limbering up, the delay of hooking in is even greater than that of unhooking, and in a cavalry fight, particularly if the attack had been successful, slowness under the circumstances would be highly dangerous to the whole force. Any reform in fire discipline which would quicken the movements of artillery in these, its most vulnerable situations, and so make it more independent of escorts, must be very advantageous.

It is suggested, therefore, that when the wagon comes into action, it should form up, as laid down in the "Field Artillery Training," with the wagon body wheel level with, and six inches from the gun wheel. The wagon would then be unlimbered and the limber sent to the rear with the gun limbers and led horses. This procedure has the following advantages. In the first place it is quick, for the wagon unlimbered by Nos. 5 and 6, should be in action very soon after the gun. Conversely it is easier to limber up than to hook in. Secondly, the wagon limber being out of the way, there is nothing to impede the field of fire of the gun. There are certain objections, technical and otherwise, but they do not seem to have great weight. It may be urged for instance, that the gun is left with only thirty-eight rounds instead of seventy-six. It is also true that when the perch of the wagon body is resting on the ground, full value is not obtained from the shield formed by the lid of the ammunition box, and that the ammunition numbers must expose themselves more to set the corrector dial, than when the wagon is limbered up. It is also slightly more difficult to withdraw ammunition.

The answer to the first is that in a cavalry fight few guns would be able to fire as much as twenty rounds in the short space of time they would be in action.

To the second and third of these objections it may be replied that the importance of protection is much diminished when the enemy consists mainly of cavalry acting mounted. The difficulty of withdrawing ammunition is infinitesimal.

In continuation of the subject of fire discipline, there arises the question of methods of fire. This consideration, one of the most important with which artillery commanders are confronted, is, of course, always dependent on the nature of the target with which he has to contend. The case in point is simple in this respect. The primary objective of the guns must be the enemy's horsemen in the various circumstances under which they may present themselves; his guns are quite a secondary consideration. The "Cavalry Training," is most explicit. "An artillery duel," it says, "carried on independently of the cavalry, is entirely out of place, and a commander who neglects to use his artillery against the enemy's cavalry must have a good reason for not doing so (sic)." The grammar is obscure, but the sense is clear.

It is equally obvious that direct action over open sights is a *sine quâ non.*

Hostile cavalry will offer several kinds of targets calling for different treatment. There may be a fleeting opportunity of firing at them before they have deployed, especially if the attack be unex-

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pected. It is needless to point out that such a target calls for a very rapid development of shrapnel fire. The enemy will then deploy, unless they can get under cover, and a wide, and to some extent scattered objective, will be formed. Subsequently the mêlée will mask the fire of the guns on both sides, and it will probably be necessary to pay some attention to the enemy's artillery, though the progress of the cavalry fight must be carefully watched. If the latter is successful, there is little object to be gained by remaining in action, unless it is possible to concentrate a heavy fire on the enemy's guns when limbering up, or on his cavalry to prevent them rallying. After the fight, however, both sides will be so inextricably mixed up, that it will be very difficult if not impossible to distinguish friend from foe. It is, moreover, important that the guns should not become separated from the cavalry, and the question of rejoining them in pursuit must be considered. The artillery commander must decide these points on his own responsibility, for orders cannot be expected in such a juncture.

The "Cavalry Training" speaks of guns aiding in the pursuit, to prevent the enemy reforming or holding positions that would check the pursuit. It is difficult to realise how this could be done, during an actual tactical pursuit. It is not likely that unsupported cavalry after being beaten by shock action could rally sufficiently to gain time for the occupation of a position to cover its own retreat. General von Bernhardi ridicules the idea of artillery co-operating effectively in the tactical pursuit. It is presuming want of vigour in the victorious cavalry to expect them to stop this tactical pursuit for some time. It is of vital importance to keep a beaten enemy on the run, and while the process continues, friend and foe will be intermingled in the utmost confusion.

If the attack fails, it is laid down that guns will remain in action to form a rallying point for the cavalry, and it is rightly pointed out that at such a juncture, their power of averting disaster depends on their not being masked by the retiring horsemen.

Returning to the question of targets, it is clear that as the enemy's lines approach, fractions of them are exposed to greater intensity of fire, but it becomes increasingly difficult, and eventually quite impossible to deal with the whole of their front, of which the angular extent will be enormous. Some part of the enemy may be expected to make the guns their special objective, and the latter will be obliged to act purely in self defence.

What information then is given in the " Field Artillery Training" as to how such targets are to be engaged?

In Sec. 45 (iii.), some instructions are laid down. They are, necessarily, somewhat vague, and deal only with " charging cavalry." Presumably cavalry charging the guns is the idea intended to be conveyed. " The main object," it says, "should be to establish a belt of fire through which horsemen are unable to penetrate." If this principle be taken in conjunction with the previous sub-section (ii.), which deals with action against infantry, on the move or otherwise, a deduction can be made in regard to the case of cavalry moving rapidly, but not necessarily to attack the guns. The principle of a

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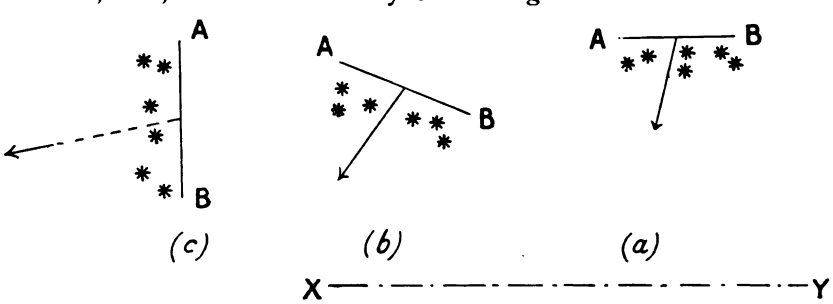
belt of fire in the enemy's path is reiterated, with the caution that a continuous rate of fire is inadvisable.

Now it is very easy to say "establish a belt of fire," but there is no very plain method given of arriving at this quickly. It is, however, quite obvious that a battery should be so trained that its commander, after firing a round or two to give a clue to the range, could indicate the range and corrector, say "zone of fire," or something of the sort, and thereby attain his object. This, though difficult, should not be impossible, and has the very great merit of necessitating only a short concise word of command to pass down the battery.

Rouquerol's interesting work "Artillerie à tir rapide," does not say much on this subject. Indeed the whole book is written from the rather limited point of view of a field battery which has been in action for some time on a reverse slope, or at any rate behind the crest. In dealing with fire against cavalry, (p.132) he says, "Cavalry constituting an objective essentially mobile, the employment of fire on a marked zone (zone repérée) seems clearly indicated." He goes on to say that if the direction of march of the cavalry is straight towards the battery, the latter will be able to fire a "rafale" with some chance of success. On the other hand, he is of opinion that such procedure is quite useless if the enemy is moving obliquely to the axis of the battery or over rough ground. "The Captain on horseback can see the objective clearly, but to the gunners on foot, and to the layers in particular, it will only show itself in short fleeting visions. . . . . this is what is most often seen at practice and on manœuvres." He then proceeds in accordance with a maxim of Frederick the Great, to advocate reservation of fire till the enemy is within 400 or 500 yards, comforting himself with the assurance that though cavalry are in much the same position now as at the time of the Seven Years War, the appliances of artillery have advanced greatly. This is nearly all that is said on the subject of rapidly moving targets, and a battery in the open, laying direct, does not seem to enter into the author's conception of what is probable. Moreover, it does not deal with cavalry except when moving to attack the guns, nor contemplate a flank attack.

It ought to be possible to develop a modified form of "rafale," which means literally a "squall," in the path of a body of cavalry, wherever they may be moving. The various natures of cavalry target reveal a feature common to all, the rapidity of their movement to front, rear, or flank. Cavalry so moving will have a wide front.



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A zone of fire to be effective should be close, and parallel, to this front, and if the front be longer than that of the guns engaging it, it is best to try and break the centre of the line.

In the above figures, AB represents a line of mobile cavalry attacking in the direction of the arrowheads. The asterisks represent shell bursting in the fire zone. From a battery parallel to XY. It is clear that in (a) the range is decreasing rapidly, and is the same for all sections; while the deflection is practically nil.

In (b), the range decreases less rapidly and is not the same for all sections, while there is a constant deflection to the left.

In (c), these features are accentuated.

It is clearly too much to expect the battery commander to give out the different ranges for each section which are necessary in cases (b) and (c); or rather it would make the procedure too slow. It seems to the writer that this must be left to section commanders, once the mean angle is found. This mean range would naturally be arrived at by the normal method of a three hundred yards bracket. At what point within the bracket it would be advisable to open fire must be determined by the eye of the battery commander. The commanders of the non-ranging sections having been informed of the mean range and the corrector, would increase or decrease this range for their sections as the case might be, taking their own part of the target. As has previously been stated, it is better to concentrate on the centre of a target which is longer than the front of a battery, than to attempt to cover the whole at once. It would never, therefore, be necessary for the difference of range between the flank guns to be greater than 100 yards, and this would only be the case when the enemy is directly enfiladed, i.e., when his line of advance is parallel to the front of the guns, and at right angles to the line of fire. The actual amount of increase or decrease necessary must be judged by eye. This requires a great deal of practice, which is unfortunately, very hard to come by. It is almost impossible to make cavalry targets at practice which will represent at all realistically the appearance of actual horsemen, and yellow screens are often actually misleading.

The laying for direction is no less important and much harder to train, because it entails an intimate co-operation between the No. 1 and the layer, and a thorough comprehension by these individuals of the principles which govern their procedure.

Great accuracy in laying for direction is not necessary against a cavalry target which presents a wide front. But if the hostile lines appear in enfilade, which would probably be the aim of the artillery commander in a cavalry fight, this rule becomes very largely modified. The more enfiladed the target is, the more careful must the laying be, if a zone of fire is to be created in its front.

Once more the representation of cavalry targets at practice by screens at intervals, which is perhaps unavoidable, combined with the vague exhortation often given to the layer not to waste time laying for direction is most misleading, and would have bad results in actual warfare. It is quite as important to train layers to lay in front of a moving target, and to utilise deflection to the same purpose, as it is to shoot in front of driven birds. With the present Q.F. gun, laying for

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direction at a moving target is attended by certain disadvantages.

1. The field of vision is limited by the shield, and a target lost sight of in the folds of the ground is harder to pick up than formerly. In this matter the value of co-operation between layer and No. 1 cannot be sufficiently insisted on.

2. Rapid traversing is less easy, because, in soft ground, the spade is apt to become buried. The gun can, of course, be traversed through 8° on its own carriage, but it should not be forgotten that 8° represents only 240 yards at a range of 1,800 yards, when the target is moving at right angles, or nearly so to the line of fire, and cavalry galloping would cover this in thirty seconds or less. In regard to the latter point, layers do not often realise that by an intelligent use of the traversing arc, they can double its value. When the trail is dropped at coming into action, the arc is presumably set at zero; as soon, however, as it is noticed that the target is moving steadily to one flank, the gun should be traversed to the extremity of the *same* side of the arc. Double the angle, i.e., 8°, can be then obtained through which the gun may be traversed without lifting the trail. A cavalry target attacking a definite objective, which would normally be our own cavalry, can be relied on to move pretty consistently in one direction.

It is, of course, to be hoped that a battery would not have to change position in order to fire to a flank. It has been pointed out above that once in action, guns become very inert, and that this consideration should influence the battery commander in his choice of a position and of the moment for unlimbering.

An unforeseen flank attack may, however, take place, especially if there is no escort. If this attack be within the limits of the danger angle, the time occupied in changing front will be greatly reduced if the personnel of the battery be trained to the use of their wits in an emergency. One section might be sufficient to engage the new enemy, but if our own cavalry had been defeated a mile or so to the front of a flank, the battery might well be called upon to face a large portion of the enemy attacking from that flank. It does not require great acumen to realise that by using the centre section as a ranging section while the flank sections are run up and back respectively, much time is saved. An unlimbered wagon is much handier in such an emergency than one that is limbered up. It is unfortunately true that the average gunner is not an adept at running a gun about by hand, and something might easily be learnt from those exercises of the Royal Navy on shore which usually excite only an indulgent smile.

The question of ammunition supply is very important with a Q.F. gun, and bears on the equally important subject of escorts. In a cavalry fight the position of the wagon line is influenced by considerations which do not ordinarily apply. The risk of being fired at is small, for the enemy's artillery will be fully occupied with the cavalry. On the other hand, led horses and wagons teams are very vulnerable to shock action, and a very small force of the enemy could inflict great damage. Any security afforded by trees or fences or the lie of the ground should, therefore, be sought. But it is important for mobility's sake that the wagon line should not be far from the

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battery. Colonel DuCane's opinion on this subject in connection with that of escorts is valuable. In his lecture, previously referred to, he says, "A point to notice in regard to this question (the security of the large number of wagons required by Q. F. batteries), is that in a cavalry encounter the result is so quickly decided that a great expenditure of gun ammunition is not possible. On the other hand, in a fire fight . . . . the expenditure will frequently be very considerable. These considerations point to the necessity of taking into the field an adequate supply of ammunition . . . . but they also lead one to suggest that it is not desirable to push anything but the firing batteries to the front in the march and manœuvre formations."

The 1st line wagons would, presumably, be left with the ammunition columns and other 2nd line transport. In the case of cavalry acting on the flank of an army, they might safely be nearer, but with independent cavalry the 2nd line transport would necessarily be some miles behind. Colonel DuCane himself says a little later, when discussing escorts, "Generally speaking, there can be no 'safe manœuvre zone' in a cavalry engagement," and this fact, which in his opinion makes an escort necessary for the guns, is equally a reason for leaving the second line transport, and the first line wagons, a long way in rear. Prejudice apart, it seems undesirable to split a battery in this way, which recalls Captain Mercer's precipitate march with "G" troop to Quatre Bras having only his guns and limbers. It will be remembered that he left his wagons with the "commissary," and that they only turned up just in time to take part in the battle of Waterloo. The guns may at any moment be called on to act in support of the cavalry fighting on foot, when a much greater expenditure of ammunition would ensue. Moreover, if the circumstances demand an escort, the addition of six first line wagons per battery would not necessitate an increase in its strength.

Colonel DuCane considers that in view of the non-existence of a "safe manœuvre zone" for artillery in a mounted combat, and the necessity for a wide separation of the guns from the cavalry mass, an escort will always be necessary. The "Cavalry Training" and General von Bernhardi have already been quoted against this view, and some remarks that the writer once heard made by a distinguished cavalry Brigadier on the subject of horse artillery action with cavalry manœuvring to charge, have also led him to conclude that an escort would not always be required. The writer cannot pretend to sufficient experience to decide a point on which such high authorities differ, but the facts illustrate the divergence of opinion between officers of the two arms as to the real tactical value of guns in such circumstances. When there is an escort, its first duty will be to secure the fire position for the guns. This is generally admitted, but the cavalry writers seem to imply that the artillery must necessarily be so near the cavalry for fear of becoming a pivot and so hampering them, that "their security will be sufficiently provided for by the general situation"; in other words, they will be within a temporary "safe manœuvre zone." The artillery authorities, on the other hand, seem to anticipate their acting as a pivot, being outside that zone, if it exists, and consequently in need of an escort. The "Cav-

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alry Training" suggests that the cavalry machine guns could be massed with the artillery and used instead of an escort. This seems very reasonable, as in a charge they would be rather an encumbrance to their regiments than otherwise. One point seems fairly certain, there must be patrols on the exposed flank, and in default of an escort this duty must be carried out by the "defensive" patrols thrown out by the cavalry during their advance, (vide "Cavalry Training," p. 204, Sec. 149 (iii.). On the other hand, unless the enemy were greatly superior, is it likely that he would split up his striking force by undertaking enterprises against the guns?

There is an important tactical consideration in regard to the escort. It happens too often that no understanding is come to between the commander of the guns and the commander of the escort, as to what the latter's duties are to be. The fault is usually on both sides, and is due to the prevailing tendency to work independently rather than in co-operation. Its remedy is not hard to find.

I have endeavoured very inadequately to outline in the foregoing pages, some of the difficulties which have yet to be solved in the combined tactics of horse artillery and cavalry in the mounted combat. My principle object was to discuss the practical side of the question, as it presents itself to gunners, but it has been impossible to illustrate these without lengthy digressions on the theory which underlies the surface questions of manœuvre and application of fire. It is often the case that enough attention is not paid to this important branch of horse artillery work. Colonel DuCane in the lecture previously referred to, if I may be forgiven for quoting once more, says, " The ground work of horse artillery training at our practice camps should, and does coincide, with that of the field artillery. The special targets however with which horse artillery will be expected to deal, will not be confined to a cavalry attack directed against the front of the guns in action. The target will more usually be represented by a body of cavalry moving at speed across the front of the guns, and covering a considerable area of ground. Our efforts should, therefore, be directed to developing effective fire against this form of target."

Horse artillery was originally created to work with cavalry. The principal rôle of cavalry is still, and must always be shock action, and if the horse artilleryman is not prepared to give efficient support under these circumstances, he loses much of his *Raison d'être.* The part he has to play is a difficult one, requiring rapidity of judgment and a highly trained personnel, for it will always be his task to develop at a moment's notice a high intensity of fire, at ranges as short as those of the Franco-German War. He may find himself called upon to deal with unforeseen and unpleasant situations, both in action and when limbered up, and he will have to decide at a moment's notice whether to continue firing, or to use his rifles, or to adopt the tactics of Norman Ramsay at Fuentes d,Onor.

In conclusion may I be allowed to emphasize as at the beginning, the enormous importance of a cordial understanding between the two services, which can only be attained when each is so conversant with the idiosyncrasies of the other, that it is able as it were to think with the other's mind, and when there is a strong spirit of mutual loyalty.

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An Historical Sketch of the Battle of Maida.

By PROFESSOR C. W. C. OMAN, Esq., F.S.A.

(A Lecture delivered at the Royal Artillery Institution, Thursday, 28th November, 1907).

Major General H. E. Belfield, C.B., D.S.O., in the Chair.

THE CHAIRMAN: Ladies and Gentlemen, Professor Oman, who is personally known to some here, and by reputation at any rate to all, has kindly come before us this afternoon to give us a lecture on the subject of the Battle of Maida, a battle which is very little known, and so far as I can trace, about which very little has been written in our Military History; and yet it is a battle to a certain extent very fruitful in lessons to us, and certainly it was one which had a material effect at the time in placing ourselves on a proper footing, as we found it, with the French.

I will ask Professor Oman to give his lecture.—*(Loud applause).*

THE LECTURER: Like the lecture on Bussaco, which the Royal Artillery Institution was good enough to hear from me last winter, this lecture on Maida is essentially a tactical and not a strategical study. My object in selecting it for your notice is that it was the fore-runner of all the great battles of the Peninsular War, so far as tactics go; it only differed from them in results because the British army was commanded by Sir John Stuart, and not Sir Arthur Wellesley. The troops and the tactics were the same, if the generalship was different. The first clash of Kempt's British light brigade and Compéres heavy battalion columns, of which I have to tell you to-day, gives the key to the whole tactical superiority of the British infantry, which lay at the base of Wellington's victorious schemes during the years 1808-1815. The battle passed without much notice at the time, because the Neapolitan campaign of 1806 forms a piece of by-play between the campaign of Austerlitz and the campaign of Jena, which few British and hardly a single continental commentator have cared to investigate. Its strategical and political results were nil; its moral results passed unperceived at the time, save among the handful of British officers of ready intelligence who laid to heart what they had seen, and stored up its teaching for future use.

It is unfortunate that we have few independent narratives of the battle of Maida either from the English or French side. There are

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Peninsular fights of which the tale can be reconstructed from the evidence of a full score of eyewitnesses on the one side or the other, especially during the later years of the war. But at Maida the numbers engaged were small, only 5,200 on the side of the British and 6,400 on that of their adversaries. The latter were not so proud of the result that they should be eager to commit their experiences to paper. The former were so few, that it is not surprising that few narratives survive—Bunbury's is the only one which runs to great length, though de Watteville's notes (sent me by his grandson to my infinite gratitude), an invaluable letter from Colborne (later Lord Seaton) then a Lieutenant in the 20th, and the interesting notes of Colonel Stewart in the regimental history of the 78th, with the diary of Charles Boothby of the Engineers, have helped me much. Reynier's dispatch has never been published; it is of great length, and along with the complete set of "morning states," and the headquarters correspondence of the army of Naples, all in the French archives, has enabled me to give the fight from the point of view of the vanquished side pretty fully. Especially, I find that I can account for the exact numbers present under Reynier, a thing that was never certainly known before. Of maps there is only one available—the very pretty and rather too detailed one which I shall have the pleasure of showing you in a few minutes. It is contemporary, and, therefore, invaluable.

Over the political preliminaries of the Calabrian campaign of 1806, I pass as lightly as possible. The imbecile King and the reckless, immoral, Queen of Naples had resolved (too late to give help, but not too late to ruin themselves,) to engage in the great coalition of Austria, Russia, and England against Napoleon, whose landmarks are Ulm, Trafalgar and Austerlitz. The Queen of Naples summoned English and Russian auxiliaries to her kingdom, and defied the Emperor just four days before the disaster of Ulm. This small and miscellaneous army, hastily gathered, had not yet crossed the Neapolitan frontier when the news of Austerlitz came to hand. Almost with it came the tidings that Napoleon had decreed that the Bourbons of Naples should cease to reign, and, freed from the Austrian war, was about to launch a great army under Massena into southern Italy. The Russians went home; the 7,000 British troops, who had been landed at Naples, were ordered by their Government to retire to Sicily, which was defensible because it was sea-girt and protected by our Naval power. Thither, too, the King and Queen ultimately retired, but they left their army behind, to be smashed up by the oncoming French. The main body was utterly defeated and dispersed at the battle of Campo Tenese in March, 1806. Only 2,000 men out of 20,000 escaped to Sicily. The sole place in the kingdom that held out—the sea-girt fortress of Gaëta, far North of Naples—was maintained by the one capable General whom Queen Caroline owned, the hard drinking, hard fighting, Prince of Hesse—Philipsthal. He held out against Masséna and the French main army from March to July, contrary to the expectation of both allies and enemies, for no one had believed that Neapolitan soldiers could fight, even behind stone walls. Meanwhile Napoleon appointed his brother Joseph King of the Two Sicilies, and bade him complete the conquest of the king-

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dom given him. The French army, marching far and wide to receive the easily won submission of the Neapolitan towns, gradually got divided into three sections, connected with each other only by insignificant posts of communication. Masséna with 15,000 men was busy in the siege of Gaëta; near him were 3,000 more men, garrisoning Naples for the new King. But St. Cyr with 12,000 men was far off, busy in occupying Apulia and the Capitanata, while the third force of 10,000 men under Reynier and Verdier, who had won the battle of Campo Tenese, and overrun all the peninsula of Calabria as far as Messina, was still more distant from the capital and the Commander-in-Chief.

The Neapolitan bourgeoisie of the county towns had accepted the nomination of King Joseph and the annexation of the kingdom with apathy. Not so the peasant of the Appennines, and especially the Calabrese, who regarded the French as atheists and aliens, and remembered the final triumph of the Bourbons and their first restoration to their Kingdom in 1799. Fifty thousand soldiers might overrun the whole Kingdom of Naples, and occupy its chief towns, but they could not occupy every village or guard every defile. Hence, when the first panic that followed Masséna's invasion was over, insurgent bands began to show themselves in the hills, and the army of occupation found plenty of work in hunting them, and failed to extirpate them.

The Bourbon government, in its refuge at Palermo, and the English General who now commanded 11,000 men in Sicily, found the temptation to try a sudden blow at the scattered French columns too great to be resisted. They undervalued the number of the enemy, whom they estimated at 30,000 instead of their real 50,000, and also believed them to be far more scattered than was really the case. The belief that Reynier had only 5,000 men in Calabria, and these scattered over the whole province, was the false conception that lay at the base of Sir John Stuart's expedition, which sailed from Messina on June 30, 1806, with no greater ambition than that of beating up the enemy, and aiding the insurgents to drive him out of Calabria. No greater scheme was at the bottom of the design, and (it may be added) neither the Sicilian government nor the brisk fussy General in command, nor Sidney Smith the active volatile Admiral who was to aid him, were capable of framing a more ambitious plan. In short, it was to be one of the pin-pricks which (down to the outbreak of the Peninsular war) were all that we ever tried against Napoleon's vast continental power.

The expeditionary force was wholly destitute of cavalry—sixteen orderly dragoons, told off to the Brigadiers, constituted its whole mounted force. There were 10 mountain guns packed on mules, and one field battery of six guns (four 6 prs. and two howitzers) with about 150 artillerymen. The infantry consisted of six infantry battalions (20th, 1/27th, 1/58th, 2/78th, 1/81st, and de Watteville's Swiss corps). But from the flank companies of these,[1] aided by the flank companies of two other regiments in Sicily, which did not sail (the 1/35th and 1/61st), there had been formed a light battalion and a grenadier battalion of seven and six companies respectively. This

[1] Only the 2/78th had been allowed to keep its flank companies, and so took the field complete.

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left the main units shorn of their picked men and short of two companies each; their numbers were very low, therefore,—the 58th had only 550 rank and file left, the 1/81st, 570, Watteville's only 520, when sick and detached were deducted,—and the sick in a Sicilian summer were always very numerous in the British regiments. It resulted that the battalions sailed with an average of not over 600 men in the ranks of each, save that the light battalion had been abnormally increased by adding to its seven companies 250 picked sharpshooters from the Corsican rangers and the Royal Sicilian volunteers, beside nearly 150 men from the battalion companies of the 35th regiment, called "flankers." For, by an evil device invented by Sir James Craig and discontinued next year by Sir John Moore, the regiments of the Mediterranean garrison, after having been skimmed already to make these light and grenadier companies, were depleted again by some twenty of the best shots being chosen from each of the eight battalion companies to act as skirmishers, alias flankers. When the "flankers," as in this case, were deducted from a regiment as well as its grenadier and light companies, the remainder was left weak in numbers as well as in efficient men. It thus resulted that the light battalions (or the light brigade as some called it) of Colonel Kempt was raised to very nearly 1,000 rank and file—of whom 320 were not British, viz. 70 men of de Watteville's battalion and 250 Corsicans and Sicilians.

The total rank and file of the expeditionary force, including the artillery, was 4,960 men; if we add the officers, whom Stuart omits in his return, after the tiresome custom then prevalent, which gave only rank and file, the force must have been about 5,200 strong of all ranks.[1] This exactly tallies with the report of Colonel Bunbury, the most accurate statistician among those who sailed from Messina on the 29th of June, 1806. That same officer adds "the 1/27th was the only battalion of old soldiers; the flank companies of the 20th, 35th, and 61st were also hard biting fellows of old standing; but the 1/58th, 2/78th, and 1/81st were young regiments." Of de Watteville's regiment it must be said that Louis de Watteville, its war-tried Colonel, and most of the Officers were Swiss patriots, who had quitted their native land after its wanton conquest by the French in 1797, and that the core of the rank and file were old Swiss soldiers of a similar sort, but the corps had only been kept up to strength by enlisting prisoners and deserters, some Swiss, but many Germans and others, of doubtful zeal. The Corsican Rangers in a similar way were full of French deserters, and some doubt was felt as to their loyalty. But the Corsicans did fairly well in the end; some of my hearers may remember that Sir Hudson Lowe was long the colonel of this regiment, and that some wits or wiseacres accounted for his being made Napoleon's jailor in 1815 by observing that "he was accustomed to deal with refractory Corsicans, and so chosen for this job."

The force was organized into four brigades, each of the absurdly small strength of two weak battalions, with an advanced guard composed of Kempt's light infantry. Of the rest Acland's brigade con-

[1] See table in Appendix of the regimental strengths.

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sisted of the 2/78th and 1/81st, Cole's of the 1/27th and the grenadier battalion, Oswald's of the 58th, de Watteville's and the 20th, which was expected to come up late, as it had been told to threaten a landing near Scilla, at the toe of the Calabrian promontory, in order to distract Reynier's attention. As a matter of fact it landed three days later than the rest of the army, on the 4th of July, the very day of the battle, yet arrived in time to take a distinguished part in the engagement. The expedition was convoyed by Sir Sydney Smith, who had with him one line-of-battle ship, the *Pompée*, and the *Apollo* frigate, with two smaller vessels of war. There was no French naval force in the neighbourhood which could threaten any harm.

The expeditionary force landed, quite unopposed, on a shingly beach, a mile below the high-lying village which gives its name to the Gulf of Santa Eufemia, on the dawn of July 1st. Calabrese peasants rowed out to the ships to warn Stuart that there were a few French troops in the neighbourhood, but no force that he need fear. The place of honour in the disembarkation should have fallen to the light battalion, but a large transport which carried Kempt and the British portion of that corps had not arrived at the rendezvous, so General Oswald started the landing with the 250 Corsican Rangers and seven companies from the 78th, 58th, and 81st. Oswald spread out his men, and advanced cautiously towards Santa Eufemia, through a scrubby wooded rising ground. When he had nearly reached it, a brisk fire broke out in his front, and the Corsican Rangers were driven in by a rush of some three hundred of the enemy. This force consisted of three companies of Poles, who had just come up from Monteleone, and did their best to disconcert the landing party by a sudden attack. But, as Bunbury remarks "they showed want of judgment in risking a contest in the wood, their true opportunity of doing us mischief was while our boats were struggling through the surf." They were driven back by the supports after a brief scuffle, in which they lost two officers and fifty men prisoners. It may seem incredible, but is stated, both in the official report, and in Bunbury's narrative, and Boothby's diary, that Oswald's force lost only one sergeant wounded.

The victorious advanced guard then advanced, and took possession of Santa Eufemia, while the disembarkation was continuing. It was completed during the day, every man, gun, and artillery mule being ashore by the evening of July 1st. That evening the advanced guard took possession of the little town of Nicastro, five miles inland, which is the chief place of the district. The Calabrese showed great pleasure at the arrival of the expedition, and in the course of the next two days, some 200 armed men joined the British; they are described by Bunbury as "ruffians of the lowest type." The better class of inhabitants, though perfectly friendly, had not yet made up their minds to risk themselves, by taking up the cause of an ally whose force was small, and might (as they guessed) take to the sea again the moment that Reynier came up in full strength.

It is clear from the general strategic position of affairs that Stuart ought to have marched at once, to catch the enemy while he was still supposed to be in a state of complete dispersion. Every day that he remained stationary gave Reynier more opportunity to con-

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centrate. Nevertheless, he lingered three days on the shore; the explanation given is that a heavy surf had sprung up on the night of July 1st, and that it was hard to get ashore the reserve ammunition, stores, and baggage animals. Meanwhile Stuart employed his time in throwing up an entrenchment on the beach. A ruined tower called the *Bastione de Malta* was taken as the centre of the work, and it was surrounded with a ditch and a semicircle of sandbags touching the shore at both ends.

Reynier, meanwhile, showed a very different sort of energy. His army was much less scattered than the British had supposed. At the moment that the expedition sailed he had seven of his ten battalions in the very toe of the Calabrian peninsula—two of the 1st Léger at Reggio, two of the 42nd Ligne at Pontemolle near Reggio, two of the 23rd Leger at Scilla, one of the 1st Swiss at Palmi, only eight miles North of Scilla. All his artillery were with him. To keep up his line of communications with the North and Naples, he had only left his three Polish battalions and part of his cavalry, dotted at intervals along the road to Cassano. One battalion of the Poles was at Tropea, on the high road, thirty miles North of Palmi, another at Monteleone, ten miles further up the road than Tropea, on the headland looking out into the Tyrrhenian sea. It was three companies from this unit which had attacked Stuart's vanguard on the morning of the disembarkation—Monteleone is only about fifteen miles from Maida beach. Lastly, the 3rd battalion was far to the North at Cosenza, with General Verdier. It had three companies detached at Cotrone (Croton) where the division had its central hospital. Of the 9th Chasseurs, one squadrón was at Catanzaro on the East coast of Calabria, the other two were with the main body of the division at a place called Maddalone, which I cannot find on the map, but which must be somewhere in the Reggio direction. Thus when the British landed at Maida, there lay North of them only one Polish battalion at Cosenza and Cotrone, and one Chasseur squadron at Catanzaro. Instead of cutting into the middle of Reynier's army, Stuart had 8,000 of its 9,000 men South of him, and only 1,000 North. It may be remarked, by the way, that Reynier in his dispatch says that he had but 7,000 men at the moment, of whom there were 1,000 out of reach at Cotrone and Cosenza. But his own morning state gives him the lie, as it shows 9,166 officers and men present on the 1st July, three days before the battle. The news that a British fleet of transports had sailed North from Messina on the morning of the 30th June started him off at once for the direction which the enemy had taken. He would not be cut off from Verdier, but would draw near his base, and fight the British at once, unless they were in overwhelming force. "Five thousand men," as he pleasantly remarked, "were enough to thrust 6,000 or 7,000 English into the water."

So he threw 632 men from the 1st and 42nd into Reggio, and 281 of the 23rd into the Castle of Scilla, with a small contingent of artillery, and marched with the 4,122 men remaining of these regiments, and his horse battery and two squadrons of cavalry, along the coast road to Maida. At Palmi he picked up the Swiss battalion 630

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strong; at Tropea the 1st Polish battalion; at Monteleone the second —the one whose detachment had skirmished with Oswald on the 3rd —which gave him 1,600 men more. The Chasseur squadron from Catanzaro also rode across the peninsula and joined him, so that he had now his whole army assembled, save the one Polish battalion in the North, and the garrisons that he had chosen to leave at Scilla and Reggio; 7,000 of his total of 9,000 men were mobilized. He depleted himself, however, of a few mounted men by leaving them at Tropea and Monteleone, as posts of connection, to keep him in communication with his southern garrisons, half a battalion of Poles and half a squadron of Chasseurs, 470 bayonets and 100 sabres. This reduced his fighting force to 6,440 men, though he understated their numbers in his report, calling them a little over 5,000 in one place, 5,150 in another, and finally 5,360 in a third passage of his long report. There is no doubt, however, that 6,440 is the right number. The troops at Tropea and Monteleone he, obviously, thought would be useful for keeping down local Calabrese insurrection while he went, as he frankly confessed, with complete confidence, to drive the English into the sea.

The field force, then, consisted of six French battalions or 4,122 men—the battalions averaging nearly 700 men, one Swiss battalion of 630 men, and two weak Polish battalions with 937 men, each of these last having left a company or so at Tropea or Monteleone. The cavalry was about 328 sabres, the artillery consisted of one horse battery with sixty-two men. There were 311 men of the sappers and artillery train.[1] The total made 6,440 of all arms and ranks, and the two infantry brigades were commanded by Compére, who had the 1st Leger and 42nd, and Digonet who led the 23rd Leger and the Poles. The cavalry were under Peyri.

Reynier's march from Reggio to Maida had been very swift. The distance is about eighty miles, and he had covered it in three days, a fine achievement over bad Calabrian roads in scorching weather. In the corresponding three days Stuart had done no more than get his men ashore and seize Nicastro, which was only five miles from his landing place. On the evening of the 3rd July the two armies discovered each other; Stuart reconnoitring in person across the short plain, with a company of grenadiers, discovered the French army just taking up its position on the heights below the village of San Pietro de Maida; Reynier ranging about with forty *chasseurs à cheval* saw the large British encampment on the shore; Bunbury says that the Generals nearly met, having passed through the same thicket on the plain of Santa Eufemia within ten minutes of each other.

Next morning, both sides being equally confident, prepared to advance. Reynier thought he was strong enough to drive Stuart into the sea. Stuart had been told that Reynier had little over 3,000 men, and had not yet been joined by his outlying troops. If the one had not advanced the other would have done so; but Stuart started first, at daybreak, leaving four companies of de Watteville's regiment and three of his six field pieces to guard his camp on the shore, at the

[1] See table at end for the exact calculation. Where was the Divisional field battery? Reynier denies its presence at the battle, yet it had been with him at Reggio, and had left behind only ten men at Scilla.

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Bastione de Malta. Deducting this small force of 300 men, and the 20th regiment which (except its grenadier and light companies) had not yet arrived, the British force consisted of pretty nearly 4,400 men, officers included. Stuart marched them in two columns along

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Plan of the Battle of Maida.

Fought on the Plains of St. Eufemia in Calabria ulterior, on the ever memorable day
JULY 4TH. 1806,
by a small British Force under the Command of

Major-General Sir J. Stuart, K.B.,

against a superior French Force under the orders of

General Reynier,

in which the former gained a most signal victory.

—:o:—

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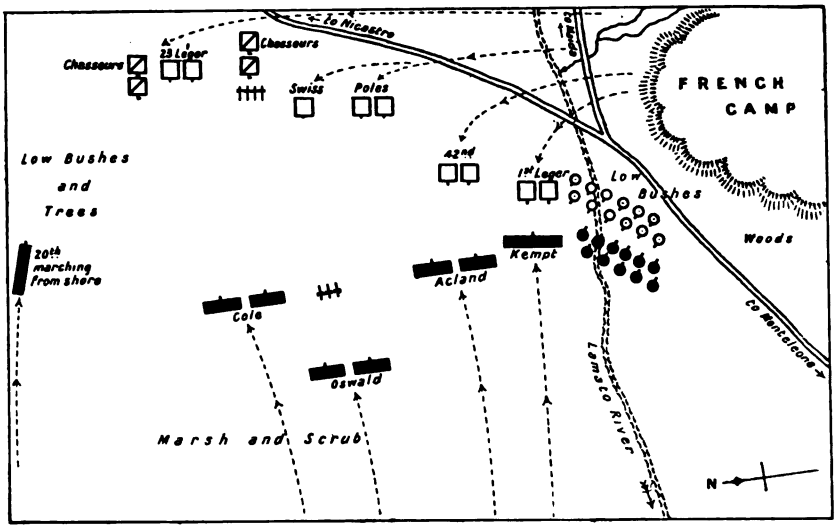

the shingly beach which separated his landing place from the French camp above Maida. Kempt's light brigade led the inland column, with Cole's behind him; Acland led the inshore column, with Oswald following; the three field guns were with this column; each brigade had two mule guns with it. As long as they were on the actual beach line Sidney Smith followed with the Apollo frigate and two other vessels, to cover the flank of the marching columns with his fire, in case the French should come down, and fight close to the water, intending to drive the British force actually into the sea.

Stuart's purpose, as stated in his dispatch, was to attack the French camp on the heights of Maida, unless he was himself assailed, meanwhile, on the march. Reynier's position, he observes, was good, the front being protected by the shallow stream of the Lamato, (everywhere fordable, but still an impediment), while its flanks, especially that on the French right, were covered by thick underwood, impervious to formed troops. The left flank seemed the weaker point, and it was this that Stuart intended to attack, forcing the enemy unless he should decide to fight in the plain, to form front to flank, in order to receive the British attack. The march of nine miles along the beach was very fatiguing, the column being compelled to shuffle along ankle deep in shingle. The grenadier battalion, who had garrisoned Nicastro, and had marched back five miles to join the main force, was especially jaded. It was a hot morning, so hot that there was a certain amount of mirage on the plain, and nothing could be made out clearly. The only touch with the enemy was produced by the fact that parties of French horse were continually seen riding parallel to the flank of Kempt's (the left) column. On reaching the mouth of the little river Lamato, Stuart had to change his direction and wheel inland, in order to approach (and out-flank) the French position. This movement took him out of the protection of the guns of Sidney Smith's vessels, which could no longer help him when he

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turned inland. The brigades now advanced in échelon, Kempt leading, then Acland, the late head of the inshore column, then Cole. Oswald, who was to form the reserve, with his weak force of eight companies of the 58th and four of de Watteville's regiment, only 850 men, was placed behind the interval between Cole and Acland. He had (as already mentioned) the three field guns with him. The march of two miles from the beach towards the French camp was far more fatiguing than the first seven miles, for the Lamato spreads out into marshes at its estuary, there was no road, save a track followed by Kempt, and many of the battalions were ankle deep in black slime.

At this moment—it was now a quarter to nine—the whole face of affairs was changed by Reynier's army suddenly leaving its position and descending into the plain, with remarkable celerity and admirable order. The French General, confident in his strength and exactly acquainted with the position of the British by means of his cavalry vedettes, had been intending to attack all along, but he had deliberately waited till Stuart should have advanced far enough from the sea to put him beyond the protection of the guns of the British squadron. He then descended upon his adversary, intending as he says in his dispatch "to make a vigorous charge, which should smash up a section of the enemy's force, so that the remainder would not be able to re-embark, and would have to surrender, especially the part which had been turning our left."

Sending out his 300 cavalry and his horse artillery guns to cover his movement, Reynier came rushing down from his camp in three columns. The southern one was to give the main blow; it consisted of the two best French regiments, four battalions of the 1st Léger and the 42nd Line, veteran troops with an old record of victory from Bonaparte's first Italian campaigns. They counted in all 2,880 men. The second column, intended to form a support for the first, or to continue its line northwards so as to form a centre for the army, was composed of the three foreign battalions, two of Poles, one of Swiss; it was much smaller than the first, counting only a little over 1,500 bayonets under General Peyri. The third column, which was led by Digonet, had a much fuller curve to make, in order to get into line; it was composed of the 1,250 bayonets of the two battalions of the 23rd Léger, and had the cavalry and guns attached to it—for Reynier's right was his weak point, being out in the open plain, and not covered (as was his left flank) by the wood lying below the French camp.

The three columns coming down the hill at the same moment, but having very different distances to cover in order to get into line, it soon resulted that the French army, like the British, fell into an échelon of brigades, with the left advanced, Compére leading, Peyri some way to his right flank and rear, and Digonet, again, some way to Peyri's right flank and rear, except that his cavalry and guns, which were already down in the low country, were far ahead of the whole of the rest of the army. These 300 sabres found themselves opposite Cole, on the left of the British line; they endeavoured to stop his progress by ostentatious preparations to charge, and brought up four

[1] "Par une charge vigoureuse écraser une partie de leure armée, ainsi que le reste ue pourroit alors se rembarquer, et devroit se rendre, surtout ceux qui auroient tourné ma ganche." Unpublished dispatch in the French Archives du Ministére de la Guerre.

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horse guns to play upon him. Cole replied by changing from column into line, and bringing up the three British field guns of the reserve, which engaged in a harmless, but noisy duel with the French battery. The result was that Cole's brigade got a little delayed, and that the échelon which it formed became separated by a considerable gap from Acland, the brigade next on its right.

Since Stuart was advancing with three brigades in échelon from the right, and Reynier with three brigades in échelon from the left, it was clear that Kempt and Compére would meet long before Acland faced Peyri, and that Acland and Peyri would be at close grips long before Cole came near Digonet's two infantry battalions. Oswald was still far to the rear of Cole and Acland, as was indeed intended. This fact settled the general shape and course of the battle,which was fought in three separate sections, starting from the East and ending in the West.

Kempt, on seeing Compére's brigade descending from the hills, formed his seven British companies in line, and threw out his 250 Corsican and Sicilian sharpshooters on his right, to cover his flank, and explore the scrubby thickets beyond the Lamato, which lay below the deserted French camp. The light battalion, according to the rules of regimental seniority, which were strictly observed, had the company of the 20th on the right, next it the two companies (flankers, &c.) of the 35th, next de Watteville's company in the centre, and finally the 61st, 58th, and 27th, the last on the extreme left.

Kempt had done well to cover his right with the Corsicans, for just as these had crossed the almost dry bed of the Lamato, and advanced among the bushes, they were charged by two companies of tirailleurs, whom Compére had placed under cover to protect his left flank. The Corsicans, receiving a sudden volley, broke, and fell back into the open ground in disorder, followed by the French. But Kempt detached his two right companies, the light company of the 20th, and the "flankers" of the 35th, who crossed the Lamato, rallied the Corsicans, drove back the tirailleurs into the wood, and left the foreign light companies to "contain" them, while they themselves returned at the double to take their place on the right of the light battalion. They had hardly reformed when the crash came.

The 1st Léger in two battalion columns was now coming down upon the right and centre of Kempt's line. Deducting the skirmishers on the eastern flank of each force, which were now bickering in the woods, the two French battalions had 1,600 men in line, the seven British companies only 700, so that the numerical advantage in favour of Compére was overwhelming. Neither side had any skirmishers out in their front, all having gone off to the flank. The ground was level and sandy, bounded by the shallow Lamato on its western side. The two forces were quite isolated for the moment, though if Kempt looked to his left rear he could see Acland coming up with two battalions in line a quarter of a mile behind him, while if Compére looked to his right rear, he could see the 42nd Ligne, also two battalions, coming on in column at a similar distance. The French 42nd, it may be remarked had 1,046 men, Acland's 78th and 81st a decidedly superior force, the Highland regiment with about 700, the 81st with

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about 600 men in line. But Peyri with 1,500 Swiss and Poles was not very far in the rear of the 42nd. The rest of the troops on either side were almost hidden from the earlier combatants by the dust and the shimmering mirage which lay over the plain on a hot day.

The whole fate of the battle turned on the first clash of arms between Kempt and the 1st Léger. It was the fairest fight between column and line that had been seen since the Napoleonic wars began —on the one side two heavy columns of 800 men each, drawn up in column of companies, i.e., with a front of some sixty men each, and a depth of fourteen, (each battalion having seven companies prêsent). The front of each was not more than sixty yards. Kempt, on the other hand, had his battalions in line, two men deep only, so that, even deducting officers, sergeants, &c., he had a front of 350 yards, only 120 yards of which had Frenchmen directly in front of it. The two battalions of the 1st Léger being a little way apart, the 1st battalion faced the 35th flankers, the 2nd the light companies of the 81st and de Watteville. Be it noted that every man in the British line was a picked marksman (all being light company men) and that every one of them could use his musket against either the front or the flank of one of the two French columns. Of the 1st Léger, on the other hand, only 240 were in first or second line and, therefore, able to fire. But of course Compére, who was riding between his battalions with his Staff, had no notion whatever of winning by fire; he was, in his own estimation, about to break through the British line by sheer impact, as he had broken through Austrians many a time in the old wars of Lombardy. His columns came down, a formidable sight from their depth and their rapid pace, looking like rolling boulders which must inevitably crash through the thin red wall in front of them. For Compére had put on full speed, knowing that the shorter time he was within musketry range the less would be his losses. The trumpets were all blaring and the men shouting "Vive l'Empereur! A le baionnette."[1] Kempt, on the other hand, halted as the enemy drew near—"Steady light infantry. Wait for the word. Let them come close." And then when the columns were within half musket shot only—"Now fire"! What followed was a puzzle to Compére and Reynier, a surprise even to the British themselves. The French received three volleys, at 150 yards, eighty yards, and twenty yards. The first laid low almost the whole first line, but the mass still came on. The second tore well into the heart of the disordered crowd whose impetus was still carrying it forward. The third turned the whole to flight. Reynier, who was watching from the rear, writes in his dispatch, "The English remained with ported arms till the 1st Léger came within half musket shot; they then opened a tremendous fire, which did not at first stop the charge, but when the columns were only fifteen paces from the hostile line, and could have broken it by one more thrust, the soldiers of the 1st turned their backs, and ran to the rear all together." He thought that he had been beaten because his men had flinched at the last moment. So did Compére, who actually rode into the British line, with one bullet in his shoulder and another in his left arm, "and was captured, menacing with the action

[1] Boothby p. 77.

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of his other arm, and cursing and swearing with the most voluble bitterness."[1]

Reynier ought to have known better what to expect; he had seen the battles in front of Alexandria, but evidently had not learnt the lesson which they might have taught him; there indeed line and column had not been pitted against each other with the beautiful simplicity that was witnessed at Maida. What is odd is that even Maida did not teach him the truth. Three years later he tried the same old tactics at Bussaco, with equally disastrous results, so that Bonaparte exclaimed "Ney and Masséna had never seen the English before; but that Reynier, whom they have already thrashed twice, should have attacked in this way is simply astounding."[2] Even after his Calabrian experiences he remained with the comforting belief that a courageous column could smash any line, and that if the experiment did not come off it was the fault of faint hearts in the rank and file.

Of the purely physical aspect of the attack of column in line I have already spoken. Eight hundred men in line cover more than twice the front of 1,600 in column, and can put in 700 shots per volley against 240, and that at a target which even with Brown Bess it was hard to miss at 100 yards. But the physical aspect of the affair is only one side of it. There remains the moral. What did the men in the column feel while attacking the line? That is harder to find, for not one Frenchman in a hundred thousand wrote down his mental experiences of the trial. One did however, and though he wrote, not of what he saw at Maida (where he did not serve), but of memories of Castalla and other fields in Spain the moral is so much the same that you must permit me to quote his text:—

"Why did we engage in so many general actions during the "seven years that I was in the Peninsula" wrote Marshal Bugeaud, "and never get the better of the English save in an insignificant "number? The reason was plain enough. We attacked them with-"out bearing in mind that tactics which answered well enough against "the Spaniards and others, failed with an English force in front. The "usual matter-of-fact cannonade would commence the operation, then "hurriedly, without reconnoitring the ground, we marched against the "enemy, 'taking the bull by the horns' as men say."

"As soon as we got about 1,000 mètres from the English line, "the men would begin to get restless and excited. They exchanged "ideas with each other, the march began to get somewhat precipitate. "Meanwhile the English, silent and impassive, with ported arms "loomed like a long red wall—an imposing attitude which impressed "novices a good deal. Soon the distance diminishes; cries of *Vive* "*l'Empereur*; *En Avant*; *á la baionnette* broke from the mass. Some "men hoisted their shakos on the top of their muskets. The march "turned into a run. The ranks began to get mixed up. The mens' "agitation became a tumult; some discharged their weapons without "halting and without aim. And all the while the red line in front,

[1] Boothby p. 79. In Colonel de Watteville's notes it is mentioned that he was shot by a man of the light company of the Swiss regiment, who had taken a deliberate aim at him.
[2] See Foy's autobiography, p. 108.

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" silent and motionless, though we had got within 300 métres, seemed " unaffected by the gathering storm."

" The contrast was striking; more than one among us began to " think that when the enemy's long reserved fire *did* begin, it might " be inconvenient presently. Our ardour began to cool. The moral " influence of apparently unshakeable calm is irresistible, in action " against disorder which strives to make up by noise what it lacks in " firmness. It used to sit heavy on our hearts. Then, at the time " of most painful expectancy, the English muskets would come down, " they were "making ready." An undefinable impression nailed to " the spot a good many of our men, who would halt and open a desul- " tory fire. Then came that of the enemy, volleyed with precision " and deadly effect, crashing upon us like thunder. Decimated, we " turned half round, staggering under the blow, and trying to regain " our balance, when the long pent up silence of the enemy was broken " by cheers. Then came a second volley, and perhaps a third, and " with the third they were down upon us, pressing us into a disorderly " retreat."[1]

The fact was that a column, with its two first ranks and half its flanks (which were exposed because of its narrow frontage) blown to pieces, was in a miserable plight. It speaks well for the 1st Léger at Maida that they stood three volleys, and that even in the 1st battalion a few desperate men staggered on to cross bayonets with the two companies of the 35th and the "light bobs" of the 20th. There is said to have occurred in this quarter a little of that rarest of things in the Napoleonic wars—bayonet fighting.

The British light infantry, with a headlong impetus charged straight after the flying mass, which scattered and went up-hill in the direction of the French camp. This was the sort of pursuit that Wellington would never have allowed: his rule was to reform before doing anything more. But Kempt forgot or failed to restrain his men; they went up-hill, shooting or making prisoners of all the slow runners among their adversaries. The first Leger was absolutely half destroyed, of 1,810 present at Maida only 953 were under arms when the next regimental muster was taken a month later. Four hundred and thirty were prisoners,[1] four hundred and twenty-seven were killed or wounded there—176 of the former, 254 of the latter apparently. Of sixty officers present, only thirty-five survived at the roll-call, of September 18; seven were killed, fourteen wounded, one an unwounded prisoner.

The rout and pursuit swept through the French camp, along the hill side beyond, and for a mile or more, till at the village of Maida, Kempt at last succeeded in checking and rallying his scattered men. Undoubtedly they had done their share in the battle, but the rest of it went on without their aid; they were a "spent force," and took no further part in the action, when their intervention might have had incalculable results. For want of a general directing mind each section of the British army fought its own battle apart.

We must now return to the plain by the Lamato. At the very

1 Note of Marshal Bugeaud, quoted in Trochin's *Armée Francaise en 1867*.
2 In September the regiment acknowleges 562 prisoners, but 133 of these were taken at Reggio later on.

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minute when the 1st Léger had begun to break up and retire, the second échelon on each side had come into action. Acland with the 78th and 81st got level with Kempt's original front at the very moment that the French 42nd Ligne came up on the flank of the 1st Léger. Here the British brigade had the advantage in numbers, having 1,300 men against 1,050, so that the victory of the line over the column would have been much more easy, even if the disaster to Compére's first échelon had not had its effect. The firing began at 300 yards; the French battalions advanced till they had received two shattering volleys, and then broke up, and fell back, demoralized, as it appears, as much by the sight of the disaster to the 1st Léger on the left, as by their own losses. Reynier merely writes that "the 42nd saw the flight of the 1st Léger, and at a moment when they were only at a very short distance from the enemy, commenced to hesitate, and followed the example of the other regiment." They had not suffered nearly so much. Of 1,046 bayonets present they had 656 left at the next regimental muster—much more than half. They had three officers killed, and nine wounded, out of forty-three present. Of the men, it seems that 379 were lost, of whom 250 were left wounded on the field—figures that show a far less bitter fight than that of the 1st Léger.

The 42nd retired, not like its left hand neighbour up the hill side, but along the Catanzaro road, directly in its own rear. Acland following the routed regiment for some way, soon came into contact with its supports, the three foreign battalions—900 Poles and 600 Swiss, a fresh force outnumbering him by 200 men. Here he had a second, but a very short fight to sustain—the Poles broke at the first shock, though Reynier himself had ridden up to them and was using all his efforts to keep them steady. Their rout was disgraceful—their casualty list shows only one officer hit, but four taken prisoners unwounded: of the men, it would appear that nearly 250 were captured, nearly all without a wound. This was the work of the 81st, while the Highland regiment at their side got engaged with the Swiss. This battalion was dressed in red, like all the other Swiss corps in the French army. According to the regimental History of the 78th, they were at first mistaken by the Scots for de Watteville's Swiss regiment of the British force, whose uniform was very similar. They were allowed to approach within a very short distance before the fighting began, and their first volley did the 78th much harm. But after ten minutes of very close fighting the Swiss gave back—though not in disorder, and fell off towards their right. Acland did not pursue them, and they took refuge with Digonet's troops on the West end of the field, where they rallied and reformed. Acland was prevented from moving after them by the French cavalry. According to Bunbury, he was threatened at this moment by one or two squadrons of *chasseurs à cheval* and two guns. His battalions being much disordered by the two fights that they had gone through, the Brigadier bade them form squares, and kept them halted for some time under artillery fire, by which they sustained some loss. When the French cavalry moved off, it was found that the battle on the left, no less than on the right, was over. Acland's brigade suffer-

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ed, in its two successive victories over the 42nd and the three foreign battalions, a heavier loss than any other part of the British army. The 2/78th had eighty-five killed and wounded, the 1/81st eighty-four—together more than half the total loss at Maida, which only came to 327 casualties.

We must now pass on to the left wing. Cole's brigade composed of the 27th and the six grenadier companies, had been detained in its advance by the demonstration of the French cavalry, and, therefore, only reached the battle ground twenty minutes after Kempt and Acland had come into action. He then found himself in front of Reynier's right, which had been delayed, like himself, by the distance it had to cover in descending from the camp. This body consisted of the two battalions of the 23rd Léger, 1,260 bayonets, and (unless I am mistaken) of the rallied Swiss battalion which had retired from Acland's front. Here too were French cavalry and four horse guns. Cole had with him about 1,300 men and the three field guns of the army. He had also in his rear Oswald's reserve, eight companies of the 58th and four of de Watteville's regiment, which were available for his help, as they were not needed elsewhere. In this part of the field, therefore, the British, when Oswald come up a quarter of an hour later, had a slight superiority of numbers, apparently 2,200 infantry and three guns, against 1,800 infantry, two squadrons (about 200 men) of cavalry, and four guns. But they were terribly handicapped by their entire want of horse; every time the Chasseurs threatened a charge, Cole had to prepare to form square, and lost time. Digonet, the French officer who commanded in this part of the field, had deployed the 23rd on one side of his guns, the Swiss battalion on the other, and stood on the defensive on a slightly rising ground. He threw his two tirailleur companies into the rough bushy ground on his right, and tried to encircle with them the left flank of the 27th regiment, while a squadron of cavalry followed the tirailleurs to protect them from any scattered advance of Cole's skirmishers. There resulted a fierce frontal fire engagement between the 27th and grenadiers on one side, and the two battalions of the French 23rd on the other; both suffered severely. Presently Oswald came up with his 850 men, and got into a similar bicker with the Swiss. The four French and three English guns seem to have paired off against each other, while the 9th Chasseurs were threatening Cole's left. The battle seemed to be standing still; yet Reynier was, as a matter of fact, only fighting a rear guard action, as he himself confesses, in order to allow his routed left time to get off. If he had ordered an advance, or tried to turn the English left, he says that the 23rd Léger would have been smashed up (abmé).

At this moment the battle came to a sudden end, by the unexpected arrival of a small additional British force. The 20th regiment, or rather its eight weak "battalion companies," about 600 men, had arrived too late to join in the march of the main army. By the advice of Sir Sidney Smith, who came out to meet their three transports on his frigate, Colonel Ross landed not where the first disembarkation had taken place, but near the mouth of the Lamato, directly behind

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the battle field, and two miles from it. As the landing began, the firing in front made itself heard, and Ross, leaving his last men still on shipboard, for the disembarkation was very difficult owing to the heavy surf on the shore, hurried off across the marsh. On his way to the front he fell in with Bunbury, Stuart's Quarter-Master General, who told him that he could strike in to the best effect by coasting along behind Cole's line, and turning the French extreme right in the bushy tract which lay beyond it. He did so, and, thrusting aside a few tirailleurs, found himself looking down the French line, with a squadron of Chasseurs just in front of him which was demonstrating against the left of the 27th regiment. Ross, forming line in the bushes as best he could, delivered a volley at fifty yards against the cavalry, which sent them in confusion to the rear. He then emerged from his shelter, and advanced, forming in line against the flank of the nearer battalion of the French 23rd. This finished the day. The enemy were already yielding before Cole's and Oswald's fire —the latter had just come up, and was getting into effective action at the same moment that the 20th appeared from the bushes. Reynier gave the order for an instant retreat, and his last three battalions went off across the open plain to the East, covered by the two remaining squadrons of the Chasseurs and the four horse guns. "If we had owned 200 good cavalry we should have destroyed the whole of them" writes Bunbury, "but we could do little more with our jaded infantry. We followed them until they abandoned the plain of Maida, and retreated rapidly up the valley through which runs the road to Catanzaro."

The French right wing had suffered severely, though not in the same proportion as their left. The 23rd Léger had two officers killed, eight wounded, and one taken prisoner without a wound. Of 1,200 bayonets present at Maida, 780 were effective in September—they had left ninety-one prisoners behind, and had about eighty killed and 250 wounded. Their Swiss auxiliaries suffered in about the same proportion to their number, with their 106 prisoners and 100 killed and wounded, more than a third of their number. The 300 Chasseurs had one officer killed, thirty-five prisoners, no doubt men whose horses had been shot, and about thirty killed and wounded.

So ended the battle of Maida. You will notice that I have not had occasion to mention Sir John Stuart once during the narrative, though Reynier's name is perpetually occurring. The explanation seems to be simply that he allowed the battle to fight itself, and gave no further orders after he had once launched his échelon of brigades against the French. His Quarter-Master General, Bunbury, writes as follows:—

"But where was Sir John Stuart? And what part did he play "in this brilliant action? To say the truth, he seemed to be rather a "spectator than the person most interested in the result of the con-"flict. He formed no plan; he declared no intention; and scarcely "troubled himself to give a single order. Perfectly regardless of "personal danger he was cantering about the field, indulging himself "in little pleasantries, as was his wont. He launched forth with par-"ticular glee when a Sicilian *Marchese*, whom he had brought as an

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" extra aide-de-camp, betook himself to shelter from fire behind a hay-
" stack: But after the charge of Kempt's light infantry and the
" utter rout of the French left wing, a change came over the spirit of
" Sir John. He still dawdled about, but broke into passionate excla-
" mations; " Begad, I never saw a thing so glorious as this! There
" was nothing in Egypt to equal it! It's the finest thing that I ever
" witnessed." From that moment he was an altered man, full of visions
" of coming greatness; as I found that I could get no orders from
" him, I made it my own business to go round to the leaders of
" brigades, to give them what information they wanted."

This picture of fussy incompetence, written by a man whom Stuart himself in his dispatches praises for his zeal and activity, is probably little exaggerated. All Sir John's subsequent actions give evidence of the most extraordinary want of military insight and enterprise—as we shall soon see. His first order was that there should be no pursuit, and that the whole army should return to the beach for repose, save Kempt's light infantry, who were completely out of call; but orders were sent to search for them in the Maida direction, and to bring them back. They only returned next morning, and not all of them then, for the light company of the 20th under Colborne, who had been directed by Kempt to go ahead and keep touch with the flying enemy till the main army should come up, had outstripped its commander, and continued to dog the steps of the demoralized French, not only on the afternoon of the 4th, but for the whole of the 5th of July, till it reached the town of Borgia, right on the other side of the Calabrian peninsula, and only ten miles from Catanzaro, where Reynier finally rallied his routed host. Then, hearing that not a man was following in his support, Colborne had to turn back.

Sir John Stuart spent the evening of his victory in dining on board Sidney Smith's flagship the *Pompée*, where he received many compliments, heard the whole story of the siege of Acre from his able, but voluable, entertainer, and was finally invested with a shawl of honour, after the oriental fashion, by his host. At daybreak he relanded, and marched his force to Maida and the French camp, where a certain amount of valuable camp equipage was picked up. Stuart slept at Maida that eve, having (according to his Quarter-Master General) spent the greater part of the day in the agonies of composition of his dispatch. This seems corroborated by the fact that it is dated on the morning of the 6th July, while the battle had taken place on the morning of the 4th. Bunbury bitterly remarks that for forty-eight hours after the victory the whole army was kept "kicking their heels and eating grapes about the hillsides of Maida," while the enemy was on his way towards a place of safety, unmolested save by the brigands of the hills.

Stuart's losses, which he carefully sums up in his dispatch, had been astoundingly small. One officer only had been killed, a Captain McLean of the 20th light company, who had served in Kempt's battalion. I know no other case where a battle of such importance was fought with the loss of one single officer to the winners. There were also the moderate number of forty-four men killed, and thirteen officers and 269 men wounded—a total casualty list of 327. It is

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notable to see how the losses were distributed; Kempt had fifty-nine killed and wounded, including the Corsicans. Acland showed by far the heaviest proportional losses in the whole army—169 killed and wounded, more than half the total list. Cole had eighty-four casualties, while Oswald and the 20th, who came up only at the very end of the fight, lost five and seven men respectively.

Still, it is an astounding fact that with a loss of 327 men, Stuart's troops had killed, wounded or taken, a full 2,000 Frenchmen. Reynier in his dispatch acknowledges a loss of 1,300, but this figure is too low. He had sixteen officers killed, forty wounded, and apparently eight[1] unwounded prisoners; of rank and file a full 900 were prisoners—more than half of them wounded—nearly 500 were killed (Stuart says that he had buried 700, but this is probably inaccurate, for that number of killed would by all battle-averages presuppose at least 2,800 wounded, and the French lost nothing like that total). The full number of wounded, who were not captured, must have been about 900, for 200 were afterwards taken at Cotrone, and Reynier had 500 in his hospitals on September 1st over and above his normal sick. Besides these we must allow for deaths and recoveries in August. If we put the total loss at 2,000 and a trifle over we are certainly very near the mark.

Reynier's dispatch, which he wrote at Catanzaro on July 5th,—twenty-four hours before Stuart got his completed,—is a curious document, in that he shows no notion whatever of the reason why he was beaten. He throws all the blame on his men; he had, he says, only 5,350 men (understating by a thousand), but that ought to have sufficed to throw 6,000 or 7,000 English into the sea. He thinks he acted for the best, "but I was not well seconded either by the number or the morale of the the troops. Many of the soldiers did not conduct themselves with the vigour of regiments who had so distinguished themselves in earlier battles. A part of them are still so demoralized that I could not count on their standing in face of the enemy again. Combien je suis malheureux d'avoir eté abandonné par mes troupes au moment ou elles devroient décider la victoire." And then he proceeds to say that they will disgrace themselves if not strengthened at once by reinforcements whose morale was intact. He had no news from Verdier at Cosenza; his only hope was in prompt aid from Naples. Of the character of the English tactics, or the effectiveness of their fire there is not a word. All blame is thrown on the cowardice of the rank and file.

César Berthier, Joseph Napoleon's Chief of the Staff at Naples, found an easier way to account for Reynier's defeat than did that General himself. He had the effrontery to write to Napoleon that there were 9,000 English at Maida, and that they had already been joined before the battle by 3,000 or 4,000 Calabrese brigands. "Ils étaient treize mille et nous avions cinq mille et cinquante!" His 9,000 British were manufactured by counting as present every battalion quartered in Sicily crediting Stuart with the 35th, 61st, and Corsican Rangers, whose light companies only were with Kempt,

[1] I have discovered their names at the Record Office—one Staff-officer, four Poles, one each from the 1st and 23rd Léger.

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and with the 39th and Chasseurs Britanniques, of whom not a man sailed at all. Moreover, Ross's disembarkment during the action is said to have brought 2,500 men to Stuart in addition to his other forces —it really, as we saw, consisted of 600 bayonets, one depleted battalion. But that was the way in which history was written to please Napoleon. He did not, however, believe it, since he read the London papers with deep interest, and generally believed them when it came to a conflict of evidence. I have noted several clear examples of this.

After Maida had been fought the campaign took a most strange aspect. I know of no other war in which, after a decisive victory, the victors and the vanquished turned their backs on each other, and proceeded to place 150 miles between them. That Reynier should turn northwards from Catanzaro, and fight his way along the East-coast road towards his base at Naples was but natural. The peasantry were already up all over northern Calabria, and Stuart might be manœuvring (for all Reynier knew) to go North by the West-coast road, and place himself between Catanzaro and Naples. He soon found that this was not the case, yet continued to fall back, harassed, but not seriously harmed, by the "Masse" as the insurgents called themselves. By the first days of August he was in the Basilicata at Cassano, where he was, as he found in safety. But when we reflect that it took him nearly a month to get to Cassano, and that Stuart could have taken a road *viâ* Cosenza which was fifty miles shorter than that of Reynier, we see that there was every chance for the British commander to cut him off.

Stuart had three choices before him on the day after Maida. There was the obvious and immediate plan of either following Reynier hot-foot to Catanzaro, or marching by Cosenza to cut him off from his retreat. If either alternative had been adopted, it would probably have resulted in the complete destruction of the French division. Secondly, a less obvious but a grander scheme presented itself. The whole object of divisions in Calabria should have been to draw off the French from the great task which they had in hand—Masséna's siege of Gaëta, which had been making such a splendid defence for six months, and was detaining in front of it the largest section of the French army. What if Stuart and Sidney Smith, leaving Reynier to force his way as best he could through the insurgents, and treating him as a negligeable quantity—which he was—had tried to do something for the relief of Gaëta?

I am here taking up Bunbury's suggestion, which seems to me absolutely conclusive. If Sidney Smith had sailed with his squadron for Gaëta, announced the victory, and landed his marines, if he had used his energy to hearten up the long-deserted garrison of the Prince of Hesse-Philipsthal, if at the same time Stuart with his transports had arrived in front of Naples, and presented himself before the city, after making a base in one of the almost ungarrisoned islands in front of it, it is practically certain that King Joseph, who had only 3,000 men in hand, would either have abandoned Naples,—which was seething with discontent and ready to rise,—or have called on Masséna to help him. But Masséna could not have helped him (having only 10,000 or 12,000 men), save by raising the siege of Gaëta, which

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would have meant the abandonment of all northern Naples and general insurrection in the Abruzzi, Molise and Campania, in either case the result would be splendid—either the capture of Naples, or the raising of the siege of Gaëta.

What Sidney Smith and Stuart found to do was something very different. The naval hero went off to make a dash at the insignificant Castle of Scilla on the Straits of Messina. He was beaten off with loss by the garrison of 250 men, the place being impregnable on the side of the sea. No news was sent to Gaëta. What Stuart did was to make up his mind, in his own words, "to begin a march southwards, preparatory to returning to Sicily." He actually handed over the Calabrias to his brigand allies, and devoted himself during the next fortnight to a march back to the Straits, sweeping up on the way the garrisons that Reynier had left in southern Calabria. The half battalion of Poles at Monteleone surrendered to him without firing a shot, so did the single company at Tropea. Reggio, where there were 600 men of the 23rd and 42nd in a weak mediæval castle, gave in almost as easily. There only remained the inaccessible fastness of Scilla, which gave more trouble, as it lay on a rocky point connected with the land by a narrow isthmus. The governor held out until heavy guns had been hoisted with infinite trouble to a commanding point on the mainland, and then laid down his arms on July 23. There were now no more French in Southern Calabria, and the bag of prisoners had been swollen by 1,300 men. Even this was ultimately increased, for Stuart sent the 78th regiment by sea to pounce on Cotrone on the East coast of central Calabria, where Reynier's last outlying post, his central hospital guarded by 250 Poles, had been left isolated. The governor surrendered at once, and some 600 men, sick or hale, were sent to Messina. Of Reynier's whole division, after this last disaster, there were left only 4,681 effective and 1,106 sick, out of 9,191 effective and 689 sick who had existed on July 1. 4,103 men had disappeared, of whom 2,732 were prisoners, and the rest dead or deserters.

But what was the use of this, when the news arrived that Gaëta had surrendered on July 18, a full fortnight after Maida, when its governor had been mortally wounded, and its garrison reduced to complete demoralization. Masséna's army was set free, he marched to deliver King Joseph from the danger of insurrection in Naples city, and then detached 8,000 men to join Reynier and Verdier, whose position was thus made secure. There was an end to any general scheme for the re-conquest of Naples, and the English abandoned Calabria to the enemy, who nevertheless took many months to subdue the fierce but ill led bands of the mountaineers, even when they were unsupported by a single British soldier. It was not till the next year that the French had, after infinite trouble, got back to the position that Reynier had held in July, 1806. Meanwhile the better part of the English army of Sicily had been sent out on the unhappy second Egyptian campaign, which proved such a fiasco under General Frazer.

The Maida campaign then, had as its sole good result, the confirming in the minds of the more intelligent British officers who had taken part in it, of the great truth of the superiority of line tactics

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over column tactics. It was of no small importance that a very appreciable number of the men who were to take an honourable part in the Peninsular war, had their first experience of fighting on a considerable scale on the Calabrian shore. You will have noted the names of Cole, the celebrated leader of the 4th division all through the Spanish war; of Kempt and Oswald, who afterwards commanded brigades in Spain, the former at Waterloo also; especially of Colborne, who as a Brigadier, fought so desperately at Albuera, and made the final attack on the French guard at Waterloo, also of Ross, a distinguished officer in the Peninsula, but better remembered as the captor of Washington. It was invaluable to the British army, two years later, to have many officers of high rank who had been eye-witnesses of this first typical clash of line with column, and who could foresee from experience what would be the result of the application of similar tactics on the battle fields of Spain and Portugal.

THE CHAIRMAN: Does any gentleman wish to ask Professor Oman any question, or to make any remarks?

If not, it only remains for me to thank Professor Oman very much in your name for having filled up what I think has been a considerable gap in most of our Military Histories. As he has said, he has been able to search deeply both in the French annals and some very obstruse English ones. I have hauled through this library here, and, when I knew that this Lecture was coming off, I sent to the Military Society at Aldershot, but have failed to be able to find anything of value about the battle. Therefore, I think we are all the more indebted to Professor Oman for having dived so deeply into records, and come here and delivered so interesting a lecture, and helped us to fill up this big gap in our Military knowledge of the past. *(Loud applause).*

APPENDIX.

Strength and Losses of the British Army at Maida.

Brigades and Battalions.		Present		Killed		Wounded	
		Officers.	Men.	Officers	Men.	Officers.	Men.
Kempt's advanced guard.	Light battalion of 7 companies of 20th, 1/27th, 1/35th, 1/58th, 1/61st, 1/81st, and de Watteville's regiment	25	510	1	7	1	42
	Flankers of 1/35th	8	151				
	Corsican Rangers 2 companies / Volunteers of Sicily 1 company	14	258	—	3	—	5
Cole's 1st Brigade.	1/27th (8 companies)	27	754	—	6	—	47
	Grenadier battalion, of 6 companies of 20th, 1/27th, 1/36th, 1/58th, 1/81st, and de Watteville's	21	464	—	4	1	26
Acland's 2nd Brigade.	2/78th (10 companies)	36	702	—	4	7	74
	1/81st (8 companies)	33	570	—	19	2	63
Oswald's 3rd Brigade.	1/58th (8 companies)	22	554	—	—	—	2
	de Watteville's (4 companies* 4 left at base)	16	271	—	—	—	3
	20th regiment (8 companies)	27	597	—	1	—	6
	Artillery (minus ½ battery left at base).†	7	129	—	—	—	3
	Total...	236	4960	1	44	11	271

* 4 companies, 13 officers and 239 men were left to guard the base dépôt at the Bastione de Malta, where the army landed.

† 2 officers, 81 men and 3 guns, left with the above named companies of de Watteville's at the base dépôt.

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Strength of the French Army at Maida.

Return of 1st July.

		Effective		Detached.	Total at Maida.	Brigade Total.
		Officers.	Men.			
Brigade Compère.	1st Léger	66	1877	133 at Reggio.	1810	2856
	42nd Ligne	64	1423	441 at Reggio.	1046	
Brigade Digonet.	23rd Léger	61	1462	250 at Scilla. 7 at Reggio. 896 at Cosenza. 100 at Tropea. 370 at Monteleone. 250 at Cotrone.	1266	2203
	1st Polomis	88	2465		937	
Brigade Peyri.	1st Swiss	35	595	—	630	958
	9th Chasseurs á cheval	30	428	130 at Tropea.	328	
Artillery	Horse	4	65	14 at Reggio.	55	112
	Foot	4	63	10 at Scilla.	57	
Sappers and Train		8	453	150 at Reggio, Cosenza & Scilla	311	411
		360	8831	2651	6440	6440

The division had, above these figures, at the same time 689 men in hospital, 48 on leave, and 7 prisoners.

Return of 18th September.

		Effective		Detached.	Total Serving.	Prisoners of War.
		Officers.	Men.			
Brigade Compère.	1st Léger	35	918	—	953	562
	42nd Ligne	27	629	—	656	695
Brigade Digonet.	23rd Léger	36	789	—	825	348
	1st Polomis	39	1179	—	1218	720
Brigace Peyri.	1st Swiss	34	498	—	532	102
	9th Chasseurs á cheval	21	254	—	265	35
Artillery	Horse	4	63	—	67	20
	Foot	5	41	—	46	
Sappers and Train		5	104	—	109	250?*
		206	4475	—	4671	2732

The division had, above these figures, at the same time 1106 sick and wounded. Adding these, and deducting the total 7413 from the total 9928 of July 1st it results that 1405 are dead or deserters.

* Number not given in the French archives, but 250 is a probable figure, since the total of sappers and train had gone down from 461 to 109 between July and September.

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Indirect Fire Implements and the Roorkee Slide Rule.

By Major T. A. Tancred, R.G.A., and Captain O. R. Swayne, D.S.O., R.G.A.

HAVING read the description and method of use of his "Field Scale for Indirect Fire," written by Captain Hill, R.F.A., in the "Journal of the Royal Artillery," August, 1907, it appears to us that the Roorkee Slide Rule is better adapted for solving Indirect Fire Problems than is Captain Hill's Field Scale.

This Slide Rule has been used by the Siege Artillery in India (not at home) for the last five years.

It solves the problems, mentioned in Captain Hill's article, with greater ease, rapidity, and accuracy, than does that officer's ingenious Scale. If the accuracy obtainable is not necessary for Horse and Field Artillery greater rapidity can be obtained by reading the Rule more roughly than is considered desirable for Siege Artillery.

In the numerical examples given in Captain Hill's clear article, it is claimed that the Field Scale easily performs the following operations in less than two minutes, viz:—

1. Finds the perpendicular base OX (fig. 1).
2. " " Apex angle.
3. " " Displacement.
4. " " Battery angle.

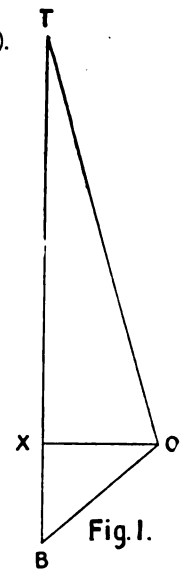

Fig. I.

It is further stated that to find the Apex angle, the length of the perpendicular base OX (fig. 1) must first be determined.

If the Roorkee Slide Rule is used to solve the triangle BOT it is not necessary to know the length of OX and the Apex and Battery angles are found at the same time. Thus the above four operations are reduced to two.

A numerical example of the triangle BOT such as might occur in the field was given for solution by the Slide Rule to the O.C., the trumpeter, and a gunner of one of the Siege companies at Roorkee.

The O.C. gave Apex angle, Battery angle, Displacement, and Battery range, in 40 seconds.

The gunner gave the same in 47 seconds. The trumpeter gave them in 1 minute 10 seconds.

More than this need not be written to show that the Slide Rule is simple. The Angle of Sight can be found in 20 seconds by mak-

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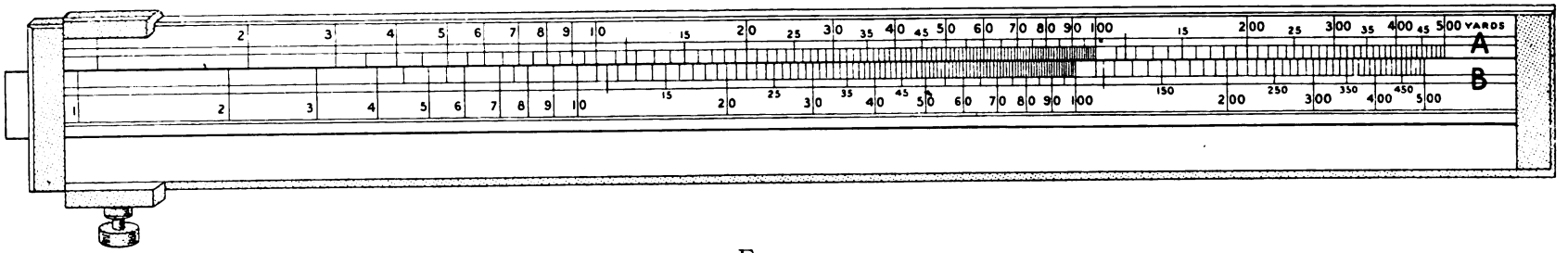

FIG. 2.

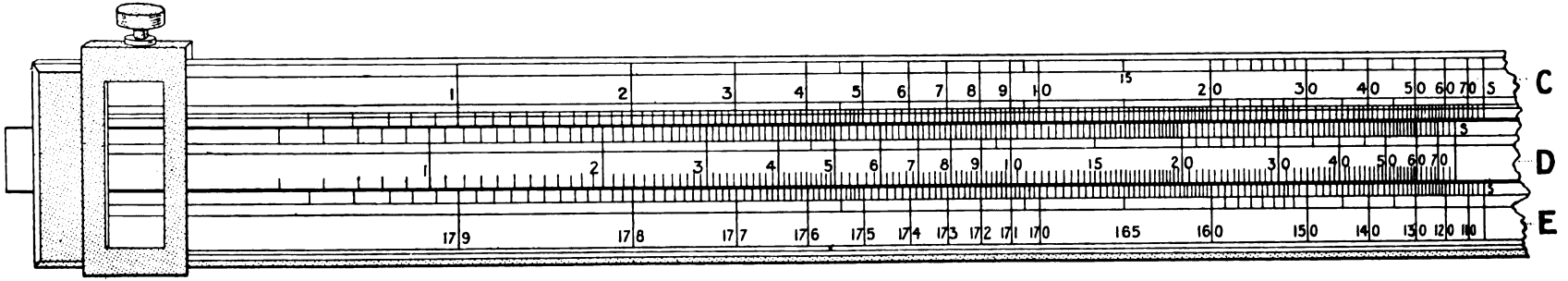

FIG. 3.

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ing only *two* moves of the slide—not *three* as has been stated in several articles in the "Journal."

Pending the completion of a certain writer's lightning calculating machine, which on moving a slide will give forth the Apex angle, Battery angle, Angle of sight, Battery range, Displacement, Fuze, and, may we hope, the History of the Regiment up to date, without the B.C. having to carry anything in his head, we claim that the existing Roorkee Slide Rule gives the necessary results better than any other device. Should the B.C's "arithmetical faculties really be chaotic," as has been shown, the trumpeter, properly trained, can work the Slide Rule for him. Should the amount of thought necessary involve too great a chance of error, let the B.C. and the Plotter work independently and compare their results.

Description:—

See Figs. 2 and 3. A and B are the ordinary yard scales. C.D. and E on the other side are the ordinary angle scales (sines).

The Roorkee Rule up to date has not been marked with scale E. This has been added for the purpose of these notes for the following reasons. It will be perceived that with two angle scales (C and D) numbered, as usual up to 90°, instances will frequently occur when to arrive at the battery angle a subtraction from 180° must be made. As it may be desirable to avoid this, we can place another angle scale (E) immediately below the scale D (which is carried right across the slide) and number it from 90° back to 180°.

Then the principle of working of the instrument will remain the same, but it will not be necessary to subtract from 180° to find the battery angle, and the procedure for Target angles above and below 90° will be the same.

Method of use:—

To solve triangle BOT (fig. 4).

Data.—OT = 4,000 yards.

BO = 450 yards.

Angle TOB[1] = 44°.

1st roughly.—Place 450 yards (BO) on the slide, scale B under 4,000 yards (OT) on scale A.

Turn the Slide Rule over. Look at 44° on scale C (fig. 5). From 44° subtract the next whole number on scale D in the direction of the smaller

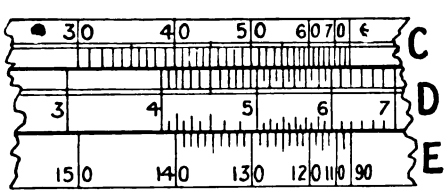

FIG. 5.

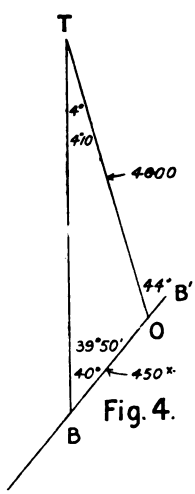

Fig. 4.

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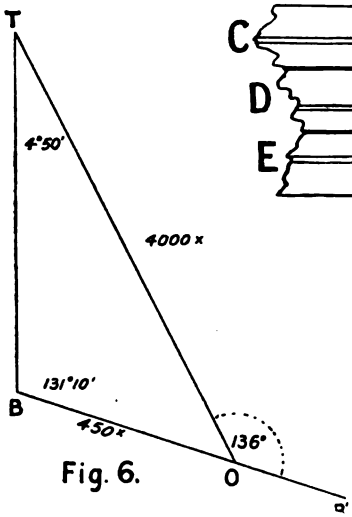

Fig. 6.

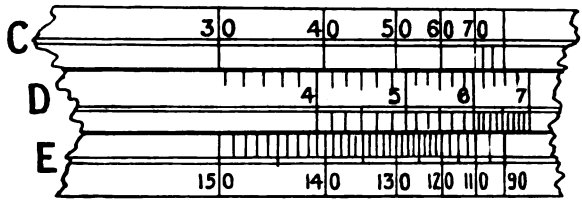

FIG. 7.

angles on C. In this case the next whole number on D is 4°.

Therefore, Battery angle = 44° − 4° = 40°.

2nd accurately.—Look at 44°, from it subtract 4° as above, 44° − 4° = 40°. Look under 40° and read 4° 10′.

Therefore, Battery angle 39° 50′ Apex 4° 10′.

Battery range. Place 40° on D under 44° on C. Turn the Slide Rule over. Over 4,000 yards on B read 4,300 yards Battery range on A.

To solve triangle BOT (fig. 6).

Data.—OT = 4,000 yards.
OB = 450 yards.
Angle TOB[1] = 136 yards.
Place 450 yards on B under 4,000 yards on A.
Turn the Slide Rule over.

Roughly.—Look at 136° on scale E. From it subtract the next whole number on D moving in the direction of the smaller angles on E. i.e., from 136° subtract 5°.

Battery angle = 136° − 5° = 131°.

Accurately.—From 136° subtract 5° as above 136° − 5° = 131°. Look over 131° and read 4° 50′. Therefore, Battery angle = 136° − 4° 50′ = 131° 10′.

Battery range.—From 131° on E look straight above to scale C and read 49°.

Place 49° on D over 136° on E. Turn Slide Rule over.

Under 4,000 yards on A read Battery range 3,700 yards on B.

Rule for finding to nearest degree, angles BTO and OBT (figs. 4 and 6):—

Look at angle TOB[1] on the rule (scales C or E) from angle TOB[1] subtract the next whole angle on scale D, moving in the direction of smaller angles on rule (scales C or E).

To find Displacement deflection.

If we take it that the line of guns is at right angles to the line of fire and that the guns are 20 yards apart, as Captain Hill does, this is quickly done (fig. 8).

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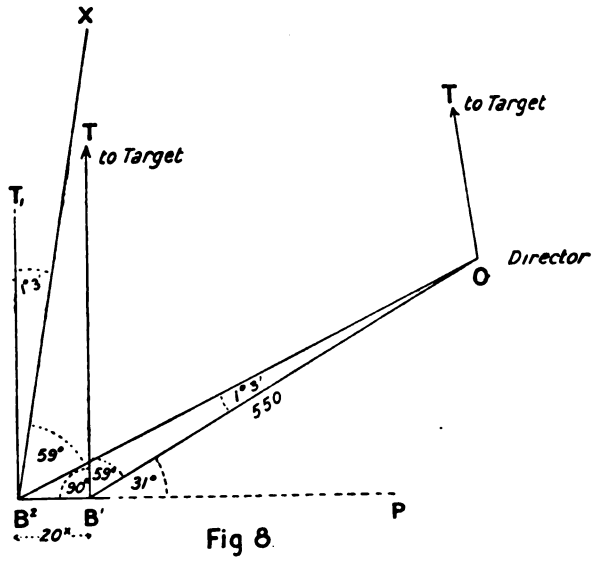

Fig 8.

See fig. 8. Angle TB^1B^2 is right angle. Battery angle 59°.

To bring the line of fire of B^2 parallel to that of B^1, B^2 must receive Battery angle 59° + angle XB^2T^1.

But angle XB^2T^1 = angle B^2OB^1.

To find angle B^2OB^1 we must solve triangle B^2OB^1.

Data.—$OB^1 = 550$ yards.

$B^2B^1 = 20$ yards.

Angle $OB^1P = 31°$.

Place 20 yards on B under 550 on A. Turn over. Opposite 31° read Displacement angle 1° 3′.

Rule for Displacement angle:—

Place distance between guns on B under distance to battery on A. Turn over. Under difference between battery angle and 90° read displacement angle.

Angle of sight:—

This can be found in the following way on any Slide Rule.

Let us take the example given by Colonel Prinsep, R.F.A., in the "Journal" for December, 1906.

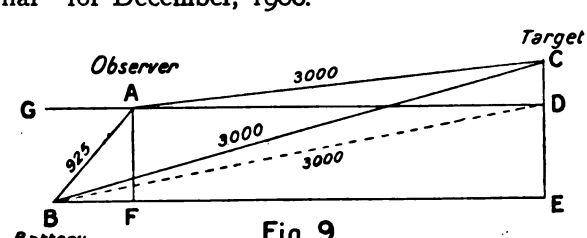

Fig. 9.

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Range AC = 3,000 yards.
AB = 925 yards.
BC = 3,000 yards.

Angle sight CAD = 30 minutes up.

Angle sight to Battery = GAB = 8 degrees down.

Observer's range and battery range being the same, in this case the battery angle of sight can be found in *one* move.

It is of no interest to the battery to know how many yards or feet A is higher than B, or how many C is higher than A.

The battery wants to know how many degrees CE subtends at battery range. To find this we must discover what AF and CD each subtend at battery range.

In this case we know what CD subtends at battery range as AC = BC = 3,000 yards. So that all we have to find is how much AF subtends at battery range = 3,000 yards.

To do this, place 925 yards on scale B (fig. 2) under 3,000 yards on scale A.

Opposite minutes in angle ABF (fig. 9) = angles GAB = 480′ on scale A we find 149 = minutes in angle DBE on scale B.

So that at battery range,

Angle to observer from battery = 149′ up.

And at same range (3,000 yards) Target is 30′ more above observer.

Therefore, angle of sight battery to target = 149′ up + 30′ up = 179′ = 3°.

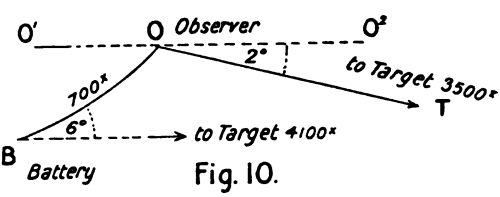

Fig. 10.

Let us take another case, see (fig. 10).

Data.—BO = 700 Angle $O^1OB = 6°$.
OT = 3500 Angle $O^2OT = 2°$.
BT = 4100.

1. Place 3,500 under 4,100. Under 120 (2°) read 102.
2. Place 700 yards under 4,100 yards. Under 360 (6°) read 62.

Battery angle of sight = 62 − 102 = −40′ = 40 minutes down.

A Switch:—

To give the new battery angle to the fresh target the new triangle Target—Battery—Observer would be solved in the same way as all other triangles as described above.

Given two sides and the included angle, the Roorkee Slide Rule will solve any triangle. The advantages claimed for it are that,

1. It is simple.
2. It is rapid.
3. It gives just so much accuracy as the man using it may require.

Any officer or man who can obtain results with the various devices previously described in the "R.A. Journal," must obtain the same with greater rapidity, and to a greater degree of accuracy with the simple Roorkee Slide Rule.

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A Reply to Major C. P. Martel's paper on "The method of carrying out practice in a Service Company of Royal Garrison Artillery.

By CAPTAIN A. E. C. MYERS, R.G.A.

IN Major Martel's very interesting article on practice in the R.G.A., there appears to be a misconception in that portion alluding to anti-torpedo boat guns.

Major Martel states that in his opinion "the results of our peace practice with light Q.F. guns are no guide to the hits we would really obtain in war time." His reason is that the corrections for deflection and travel will not be known beforehand in war time, whereas in peace time they are known, and have not to be altered suddenly.

This would certainly be a most excellent reason, if the premises were sound. Nothing *could* be more fatal to shooting than to have the G.G.C., after the target is sighted—a target he will probably see for barely a minute—thinking of what his correction for travel and his deflection is to be, shouting it out, and the gun layers trying to put it on in the dark. If this was necessary, then the hits in war would probably be 25% of what they are in peace.

Luckily, however, in war time, *no corrections for deflection or travel would be necessary* except on the rarest of occasions. To prove this, it is necessary to discuss two things, viz., the target and the range. The target will probably be a foreign destroyer of 25 or 26 knots, or a seagoing torpedo boat of 23 knots. The speed quoted is the maximum trial speed less three knots. As to range, Major Martel mentions 2,500 yards, but "Garrison Artillery Training," Vol. 1, gives 1,500 yards as the effective range on an ordinary night of the most concentrated dispersed beam, viz. the 16° one, and many people think this optimistic.

Let us take deflection first.

Presume any of the above boats running at full speed at right angles to the line of fire. With *no* deflection they would all be hit up to ranges between 1,700 and 1,800 yards, and in view of the limits imposed by searchlights, it is not necessary to consider further ranges. Certainly they would be hit rather far back, but still they would be hit. At close ranges they would of course also be hit, but this time well forward. If they require no deflection when travelling at right angles, then they never require any deflection and will be hit at any speed and any course they run on.

Suppose the G.G.C., however, did stop to think, and gave deflec-

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tion so as to hit the boat in the middle, and the deflection was put on correctly; he would hit the boat in the middle for a round or so, and then his shots would travel to the front of the target and would eventually miss the boat at the closer ranges unless he made another change or changes, involving more delay.

Surely then, as regards deflection, it will be better to make it a general rule to start with none.

Now as to correction for travel.

Here anyway at first sight one will say that one correction will not suit all courses; that a different correction is required for a target coming in at twenty-five knots, to what is required to one going out at twenty-five knots.

It is not so.

If no deflection is required to hit a target going at right angles to the line of fire, then no correction for travel is ever required, and no matter at what angle the boat is approaching or receding, the boat will be hit. It is true, as in the deflection, the hits will not be in the centre of the boat. At long ranges they will be towards the rear, and at close ranges towards the front; but still the boat will be hit, and at medium ranges in the middle.[1]

As regards torpedo craft then, we can eliminate the uncertain corrections that we do not know, and start with no correction for travel or deflection.

There is no doubt that our night practice from anti-torpedo-boat guns is a more realistic piece of sham warfare than any other practice, field day, or sham fight of any description, and the results obtained *are* certainly a very great guide to what we shall do in war.

[1] The case where the boat is end on, and steaming directly away from the battery, so that the stern has to be layed on, is exceptional.

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INDEX—VOL. XXXIV.

A

PAGE.

Abdy, A. J., Col. R.A.; A Senior Officers' Course at Hythe 335
Aiming Point, the Sun as an; by Major A. L. Walker, R.F.A. 52
Ammunition columns, the training of the personnel for; by Maj. G. R. Talbot, Devon R.G.A. (M). 105
Anderson, A. T., Major R.F.A.; A few remarks on Major J. G. Geddes' methods of estimating displacement, etc. 524
Archdale, T. M., Capt. D.S.O., R.H.A.; three weeks in Manchuria 90
Army and Navy, co-operation of in war as promoted by the Naval War Course; by Colonel H. C. C. D. Simpson, C.M.G., R.A. 525
Artillery in enclosed and wooded country, notes on the tactical employment of; by Major H. C. Williams-Wynn, R.F.A. 363
Artillery in the field, the application of Lt.-Col A. ff. Powell's rules for calculation of angles of sight and apex angles to; by Maj. J. G. Geddes, R.F.A..... 110
Artillery in the field, choice of positions for; by Colonel F. G. Stone, R.A.G. ... 238
Artillery in the field, choice of positions for; a reply by Maj. J. F. Cadell, R.A. 347
Artillery in the field, methods of estimating displacement and for reckoning displacement differences for; by Major J. G. Geddes, R.F.A. 253
Artillery patrols; by Lieut. J. A. Dane, R.F.A. 53
Artillery, recent changes in the Royal Regiment of; by Major J. H. Leslie, R.A. (retired) 421
Artillery, Siege, the training of; by Capt. C. N. Buzzard, R.G.A. 297
Artillery under the provisions of the Territorial and Reserve Forces Bill, 1907; by Colonel H. C. C. D. Simpson, C.M.G., R.A. 329
Artillery, the British at Waterloo; by Capt. A. F. Becke, late R.F.A. 313
Auto sights, ratio of movement in; by Major L. E. B. Dykes, R.A. 469

B

Balloons and Search lights, a method of ranging against with time shrapnel: by Captain C. C. Noott, R.G.A. 10
Battle of Maida, the; A lecture by Professor C. W. C. Oman 541
Battleships and armoured cruisers, the effect of modern projectiles against; by A. G. Hadcock, Esq., late R.A. 1
Becke, A. F., Capt. late R.F.A.; The British Artillery at Waterloo 313
Belfield, H. E., Maj.-Gen. C.B., D.S.O.; discussion Major Ross' lecture 445-6
Belfield, H. E., Maj.-Gen. C.B., D.S.O.; Chairman Professor Oman's lecture 541-563
Bellairs, N. E. B., Capt. R.G.A.; firing over friendly infantry 368
Bethell, A. H., Lt.-Col R.F.A.; the Austrian Q.F. field gun, 1905 pattern 233
Birch, J. F. N., Major R.H.A.; hard mouthed horses 195
Birch, J. F. N., Major R.H.A.; experiments in the teaching of equitation at the Riding Establishment 448
Bird, M. H. C., Capt. R.G.A.; battery drill and ranging exercises with puffs... 515
Boger, R. W., Maj. & Bt. Lt.-Col. R.F.A.; Overland to Japan 351
Brady, T. M., Qr.-Mr. Sgt. Instr. in Gunnery; makeshift method of entraining Field Artillery 359
Buckle, C. R., Major D.S.O., R.G.A.; fighting guns landwards 179
Bullets, pointed; by Capt. J. H. Hardcastle, R.A. (retired) 377
Burney, P. de S., Major R.G.A.; a criticism on Capt. Noott's suggested alteration in graduating directors and goniometric sights 68, 132
Buzzard, C. N., Captain R.G.A.; a method of employing two limbers as an observing station 251
Buzzard, C. N., Capt. R.G.A.; the training of Siege Artillery 313

38.

Digitized by Google

PAGE.

C

Cadell, J. F., Major R.A.; a reply to Col. Stone's paper on choice of positions for artillery in the field 347
Calthrop, E. F., Capt. R.F.A.; notes on recent changes in the Japanese Field Artillery manuals 201
Capabilities of mules as transport animals; by F. J. Dawson, Esq. 70
Chamberlain, H., Lieut. R.N. (retired); discussion Major Ross' lecture 446
Changes, recent, in the Royal Regiment of Artillery; by Maj. J. H. Leslie, R.A. (retired) 421
Choice of positions for artillery in the field; by Col. F. G. Stone, R.G.A. 238
Choice, of positions for artillery in the field; by Maj. J. F. Cadell, R.A. 347
Clutterbuck, St. J. R., Lieut. R.F.A.; the need of a one man rangefinder for field artillery 370
Coast fortresses, landings against, and the rôle of movable armament; by Capt. G. G. Thatcher, R.G.A. 45
Coast fortresses, the value of; by Lieut. H. G. de Watteville, R.A. 111
College, the Ordnance; by Colonel G. R. Townshend, R.A. 244
Communication in the division; by Capt. J. E. F. d'Apiece, R.A. 475
Concealed positions for field artillery; by Col. F. D. V. Wing, C.B., R.F.A. 7
Corrector, A; by Lieut. G. H. V. Holdich, R.G.A 36
Counter-Attack, the; by Capt. C. C. Robertson, R.F.A. 303
Course at Hythe, a senior officers'; by Col. A. J. Abdy, R.F.A. 335
Cowan, H. V., Colonel C.V.O., A.-D.-C.; Chairman Major Ross' lecture ... 434, 445-6

D

Dane, A. J., Lieut. R.F.A.; artillery patrols 53
D'Apiece, J. E. F., Capt. R.F.A.; communication in the Division 457
Davson, H. F., Captain R.H.A.; Napoleon's Marshals:—

(1). Lannes 169

(2). Davout 425

(3). Ney 477

Dawson, F. J., Esq.; the capabilities of mules as transport animals 70
Defence of a temporary Naval base; by Capt. A. E. C. Myers, R.G.A. 226
Director and observation ladder combined; by Capt. H. E. Molesworth, R.G.A. 263
Division, communication in the; by Capt. J. E. F. D'Apiece, R.F.A. 457
Duncan Gold Medal Prize Essay, 1907; by Major H. S. Jeudwine, R.A. 113
Duncan Silver Medal Prize Essay, 1907; by Capt. W. H. Moore, D.S.O., R.G.A. 133
Duncan Commended Essay, 1907; by Major K. K. Knapp, R.G.A. 265
Duncan Commended Essay, 1907; by Capt. O. L. Price, R.G.A. 280
Duncan Commended Essay, 1907; by Major T. B. Wood, R.G.A. 393
Dykes, L. E. B., Major R.G.A.; ratio of movement in auto-sights 469

E

Entraining field artillery, a makeshift method of; by Qr.-Mr. Sergt. T. M. Brady, R.A. 359
Equitation, experiments in teaching; by Major J. F. N. Birch, R.H.A. 448
Errata 168, 264
Essay, Duncan Gold Medal Prize 1907, to what extent may guns and howitzers of greater calibre than those of our field artillery co-operate usefully in field operations and what rules should govern their tactical employment; by Major H. S. Jeudwine, R.A. 113
Essay, Duncan Silver Medal Prize 1907, to what extent may guns and howitzers of greater calibre than those of our field artillery co-operate usefully in field operations and what rules should govern their tactical employment; by Captain W. H. Moore, D.S.O., R.G.A. 133
Essay, Duncan Commended, 1907; by Major K. K. Knapp, R.G.A. 265
Essay, Duncan Commended, 1907; by Captain O. L. Price, R.G.A. 280
Essay, Duncan Commended, 1907; by Major T. B. Wood, R.G.A. 393
Experiences of the past and their application to the present (a lecture); by Colonel Lonsdale Hale, R.E. 73
Experiments in the teaching of equitation at the Riding Establishment; by Major J. F. N. Birch, R.H.A. 448

Digitized by Google

PAGE.

F

Field Artillery, concealed positions for; by Colonel F. D. V. Wing, C.B., R.F.A. 7
Field Artillery, makeshift method of entraining; by Qr.-Mr. Sergt. T. M. Brady, R.A. 359
Field Artillery, need of a one man rangefinder for; by Lieutenant St. J. R. Clutterbuck, R.F.A. 370
Fighting guns landwards; by Major C. R. Buckle, D.S.O., R.G.A. 179
Fire, lines of; by Capt. H. G. Lloyd, R.F.A. 15
Firing over friendly infantry; by Lt.-Col. R. G. Strange, R.F.A. 249
Firing over friendly infantry; by Capt. N. E. B. Bellairs, R.A. 368
Fortresses, Coast, the value of; by Lieut. H. G. de Watteville, R.A. 411
Fulton, J. D. B., Capt. R.F.A.; slide rule methods examined 19

G

Geddes, J. G., Major R.F.A., the application of Lt.-Col. Powell's rules for calculation of angles of sight and apex angles, to artillery in the field 110
Geddes, J. G. Major R.F.A.; methods of estimating displacement and for reckoning displacement differences, for artillery in the field 253, 524
Gibraltar; remarks on Captain FitzGibbon's paper on the R.A. at the siege of... 260
Gun, the Austrian Q.F. 1905 pattern; by Lt.-Col. A. H. Bethell, R.F.A. 233

H

Hadcock, A. G., Esq., late R.A.; the effects of modern projectiles against battleships and armoured cruisers 1
Hale, Colonel Lonsdale; experiences of the past and their application to the present (a lecture) 73
Hardcastle, J. H., Capt. R.A. (retired); pointed bullets 377
Hawkshaw, Lt.-Col. L. L. Legion; letters from Major Norman Ramsay, to 111
Hill, H. W., Capt. R.F.A.; a field scale for indirect firing 185
History, and dates of formation of the Companies of R.A., 1705-1757; by Major J. H. Leslie, R.A. (retired) 65
Hoblyn, E. F., Major R.A.; the limit of vision as applicable to short base rangefinder 214
Holdich, G. H. V., Lieut. R.G.A.; a corrector 86
Horse Artillery and shock tactics; by Lieut. H. W. Wynter, R.H.A. 528
Horses, hard mouthed; by Major J. F. N. Birch, R.H.A. 195
Horses, swimming; by Colonel E. J. Phipps-Hornby, V.C., R.H.A. 509
Howitzers, a suggested system of ranging from a standard of yards instead of a standard of degrees; by Colonel S. W. Lane, R.F.A. 312
Hythe, a senior officers' course at; by Colonel A. J. Abdy, R.F.A. 335

I

Indirect fire implements and the Roorkee Slide rule; by Major T. A. Tancred and Capt. O. R. Swayne, D.S.O., R.G.A. 565
Indirect fire, a field scale for; by Capt. H. W. Hill, R.F.A. 185
Infantry, firing over friendly; by Lt.-Col. R. G. Strange, R.F.A. 249
Infantry, firing over friendly; by Capt. N. E. B. Bellairs, R.A. 368
Initiative in National Strategy (a lecture); by Major C. Ross, D.S.O., *psc.*, Norfolk Regiment 434

J

Japanese field artillery manuals, notes on recent changes in; by Capt. E. F. Calthrop, R.F.A. 201
Japan, overland to; by Major & Bt. Lt.-Col. R. W. Boger, R.F.A. 351
Jeudwine, H. S., Major R.A.; Duncan Gold Medal Prize Essay, 1907 113

K

Knapp, K. K., Major R.G.A.; Duncan Commended Essay, 1907 265

Digitized by Google

PAGE.

L

Landings against Coast fortresses, and the rôle of movable armaments; by Capt. G. G. Thatcher, R.G.A. 45
Lane, S. W., Colonel R.F.A.; a suggested system of ranging howitzers from a standard of yards instead of a standard of degrees 312
Langres, the siege operations at, August-September 1906; by Colonel H. C. C. D. Simpson, C.M.G., R.A. 145
Lecky, F. B., Colonel D.S.O., R.H.A.; Chairman Colonel Hale's lecture 73-85
Leslie, Major J. H., R.A. (retired); some remarks upon the early history and dates of formation of the companies of R.A., 1705-1757 65
Leslie, Major J. H., R.A. (retired); some notes upon the origin, formation and subsequent development of the Madras Horse Artillery represented in the year 1907 by "J," "M," "P," and "R" Batteries, R.H.A. 217
Leslie, Major J. H., R.A. (retired) recent changes in the Royal Regiment of Artillery 421
Leslie, Major J. H., R.A. (retired); some remarks concerning the R.A., at the battle of Talavera 503
Letter from Major William Norman Ramsay to Lt.-Col. Hawkshaw 111
Life and recreation in Sierra Leone; by Capt. C. E. Palmer, D.S.O., R.F.A. 41
Lines of fire; by Capt. H. G. Lloyd, R.F.A. 15
Lloyd, H. G., Captain R.F.A.; lines of fire 15

M

Madras Horse Artillery uniforms, buckle and waistbelt, girdle, helmet, dress jacket, &c., &c. 224
Madras Horse Artillery as represented in the year 1907, by "J," "M," "P," and "R" batteries, R.H.A.; by Major J. H. Leslie, R.A. (retired) 217
Maida, the battle of (a lecture); by Professor C. W. C. Oman 541
Maguire, T. Miller Esq., M.A., LL.D.; the Rhine (a lecture) 487
Manchuria, three weeks in; by Capt. T. M. Archdale, D.S.O., R.H.A. 90
Martel, C. P., Major R.G.A.; on the method of carrying out practice in a service company R.G.A. 339, 571
McHardy, A. A., Capt. D.S.O., R.G.A.; Somaliland and its Mad Mullah 57
Messing, a system of, suitable for a brigade of Artillery; by Captain C. C. Robertson, R.F.A. 518
Methods of estimating displacement and for reckoning displacement differences for Artillery in the field; by Major J. G. Geddes, R.F.A. 253
Molesworth, H. E., Capt. R.G.A.; a combined observation ladder and director... 263
Moore, W. H., Capt. D.S.O., R.G.A.; Duncan Silver Medal Prize Essay, 1907 133
Mules as transport animals; by F. J. Dawson, Esq. 70
Myers, A. E. C., Capt. R.G.A.; defence of a temporary Naval base 226
Myers, A. E. C., Capt. R.G.A.; practice in a service company R.G.A., a reply ... 571

N

Naval War Course; by Col. H. C. C. D. Simpson, C.M.G., R.A. 525
Napoleon's Marshals; by Capt. H. M. Davson, R.H.A.:—

(1). Lannes 169

(2). Davout 425

(3). Ney 477

Nicolls, E. G., Col. R.A.; Siege Artillery lessons from Port Arthur 25
Nootts, E. C., Capt. R.G.A.; a method of ranging with time shrapnel, chiefly for use against balloons and search lights 10
Nootts, E. C., Capt. R.G.A.; a reply to Major Burney's criticisms 132

O

Observation ladder and director combined; by Capt. H. E. Molesworth, R.G.A. 263
Observation station a method of employing two limbers as; by Capt. C. N. Buzzard, R.G.A. 251
Oman, C. W. C., Professor; a historical sketch of the battle of Maida (a lecture) 541
Ordnance College Woolwich; by Col. G. R. Townshend, R.A. 244
Overland to Japan; by Major & Bt. Lt.-Col. R. W. Boger, R.F.A. 351

Digitized by Google

PAGE.

P

Palmer, C. E., Capt. D.S.O., R.F.A.; life and recreation in Sierra Leone 41
Patrols, artillery; by Lieut. A. J. Dane, R.F.A. 53
Phipps-Hornby, E. J., Col. ℭ.ℭ., R.H.A.; swimming horses 509
Pointed bullets; by Capt. J. H. Hardcastle, R.A. (retired) 377
Port Arthur, Siege Artillery lessons from; by Col. E. G. Nicolls, R.A. 25
Practice in a service company R.G.A., the method of carrying out; by Major C. P. Martel, R.G.A. 339, 571
Price, O. L., Capt. R.G.A.; Duncan Commended Essay, 1907 280
Projectiles, modern, the effect of, against battleships and armoured cruisers; by A. G. Hadcock, Esq., late R.A. 1
Puffs, battery drills and ranging exercises with; by Capt. M. H. C. Bird, R.G.A. 515

R

Ramsay, W. Norman, Major Horse Artillery, letter from, to Lieut.-Colonel Hawkshaw 111
Rangefinder for field artillery, the need of a one man; by Lieut. St. J. R. Clutterbuck, R.F.A. 370
Rangefinder, short base, the limit of vision applicable to; by Major E. F. Hoblyn, R.A. 214
Ranging howitzers from a standard of yards instead of a standard of degrees; by Colonel S. W. Lane, R.F.A. 312
Ranging with time shrapnel against balloons and search lights; by Capt. C. C. Noott, R.G.A. 10
Ratio of movement in auto-sights; by Major L. E. B. Dykes, R.A. 469
Rhine, The (a lecture); by Dr. T. Miller Maguire 487
Riding Establishment, experiments at, in the teaching of equitation; by Major J. F. N. Birch, R.H.A. 448
Robertson, C. C. Capt. R.F.A.; the counter attack 303
Robertson, C. C., Capt. R.F.A.; a system of messing suitable for a brigade of artillery 518
Royal Artillery, some remarks upon the early history and dates of formation of companies, 1705-1757; by Major J. H. Leslie, R.A. (retired) 65
Royal Artillery at the battle of Talavera, some remarks concerning; by Major J. H. Leslie, R.A. (retired) 503
Ross, C., Major D.S.O., Norfolk Regiment; the initiative in National Strategy (a lecture) 434, 447

S

Scale, the field, for indirect fire; by Capt. H. W. Hill, R.F.A. 185
Searchlights, a method of ranging against with time shrapnel; by Capt. C. C. Noott, R.G.A. 10
Siege artillery lessons from the Siege of Port Arthur; by Col. E. G. Nicolls R.A. 25
Siege Artillery, the training of; by Capt. C. N. Buzzard, R.G.A. 297
Siege operations at Langres 1906; by Col. H. C. C. D. Simpson, C.M.G., R.A. 145
Sierra Leone, life and recreation in; by Capt. C. E. Palmer, D.S.O., R.F.A. 41
Simpson, H. C. C. D., Colonel C.M.G., R.A.; Siege operation at Langres, 1906 145
Simpson, H. C. C. D., Colonel C.M.G., R.A.; the Artillery under the provisions of the Territorial and Reserve Forces Bill, 1907. 329
Simpson, H. C. C. D., C.M.G., R.A.; the co-operation of the Army and Navy in war as promoted by the Naval War Course 525
Slide rule methods examined; by Capt. J. D. B. Fulton, R.F.A. 19
Slide rule, The Roorkee, and indirect fire implements 565
Somaliland, and its Mad Mullah; by Capt. A. A. McHardy, D.S.O., R.A. 57
Stone, F. G., Colonel R.G.A.; choice of positions for artillery in the field 238
Strange, R. G., Lt.-Col. R.F.A.; firing over friendly infantry 249
Strategy, the initiative in National (a lecture); by Major C. Ross, D.S.O., Norfolk Regiment 434
Sun, as an aiming point; by Major A. L. Walker, R.F.A. 52
Swayne, O. R., Capt. D.S.O., R.G.A.; indirect fire implements and the Roorkee Slide rule 565
Swimming horses; by Col. E. J. Phipps-Hornby, ℭ.ℭ., R.H.A. 509

T

Tactical employment of artillery in enclosed and wooded country; by Major H. C. Williams-Wynne, R.F.A. 363

Digitized by Google

PAGE.

Talbot, G. R., Major Devon R.G.A. (M); the training of personnel for ammunition columns 105
Talavera; some remarks concerning the Royal Artillery at the battle of 503
Territorial and reserve Forces Bill 1907, the artillery under the provisions of; by Colonel H. C. C. D. Simpson, C.M.G., R.A. 329
Thatcher, G. G., Capt. R.G.A.; landings against coast fortresses and the rôle of movable armaments 45
Townshend, G. R. Colonel; the Ordnance College Woolwich 244
Training of personnel of ammunition columns; by Major G. R. Talbot, Devon R.G.A. (M) 105
Training of siege artillery; by Capt. C. N. Buzzard, R.G.A. ..... 29[illegible]
Tylden, W., Brig.-Gen.; Chairman Dr. Maguire's lecture ..... 48[illegible]

V

Vision, the limit of as applicable to short base rangefinder; by Major E. F. Hoblyn, R.A. 214

W

Walker, A. L., Major R.F.A.; the sun as an aiming point 52
Waterloo, the British Artillery at; by Capt. A. F. Becke, late R.F.A. 313
Watteville, de H. G., Lieut. R.G.A.; the value of coast fortresses 411
Whinyates, Gen. F. F., Madras Horse Artillery 217
Williams-Wynn, H. C., Major R.F.A.; notes on the tactical employment of Artillery in enclosed and wooded country 363
Wing, F. D. V., Col. C.B., R.F.A.; concealed position for field artillery 7
Wood, T. B., Major R.G.A.; Duncan Commended Essay, 1907 393
Wynter, H. W., Lieut. R.H.A.; Horse Artillery and shock tactics 528

END OF VOLUME XXXIV.

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Reports, Precis, Translations, Etc.
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CONTENTS.

HISTORICAL EXAMPLES OF SIEGES FROM THE FRANCO-GERMAN WAR OF 1870-71.

(Kriegsgeschichtliche Beispiele des Festungskrieges aus dem deutsch-französischen Kriege von 1870-71. *Berlin,* 1899*).*

BY FROBENIUS.
Lieut.-Colonel of Engineers in the German Army (retired list).

TRANSLATED BY CAPTAIN M. H. C. BIRD, R.A.

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VOLUME III.—PARIS.

I.—INVESTMENT.

4. PARIS.

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CAPTAIN M. H. C. BIRD, R.A.

VOLUME III.

I. INVESTMENT.

4. PARIS.

(a). The fortress before the investment.

In the general arrangement of its works, Paris resembles our idea of a modern fortress more than any of the other French fortresses with which the Germans had to deal in the course of the war of 1870-71. A consideration of the steps taken for the defence of the capital, of the circumstances which delayed the siege, and of the means which eventually produced the desired results, will therefore afford us some clue to the probable course which sieges will take in the future. For the present, however, we must confine our attention to the period of investment, which was terminated by the placing in position of heavy guns, not for the purpose of reinforcing the investing positions as at Metz, but in order to engage the guns of the fortress, thus marking the first assumption of the offensive on the part of the Germans. The bombardment and its consequences will be treated of in a later volume.

Its ring of forts extended over 34 miles, and Paris was, therefore, in 1870, a unique specimen of a monster fortress. Some of the new fortresses hardly come short of this circumference; for instance, Verdun, with a perimeter of 30 miles; Toulon, including the sea front, with 32; some of them even exceed these limits, like Lyon, with 42 miles, and Bukharest with 40 (according to Brialmont's pro-

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ject, Captain Schröter gives it as 46½ miles). Although the general arrangement and the intervals of the 16 detached forts do not altogether correspond with those to be found in modern works, yet the general character of the ring of forts as a whole was the same—that of a ring-shaped, defensive position, of which the points of chief tactical importance were occupied by independent unscaleable works, forming supporting points for the rest of the line. The forts were still armed with a large number of guns, mounted on an open parapet; but already the ground secured by them afforded sufficient room to supplement the Artillery position by the construction of batteries in the intervals. All the advantages which the ring of forts affords to an active defence could be reaped by the Governor of Paris in 1870.

And he was in a far more advantageous position than the Governor of Metz, for his forts were already built. They only wanted completion by the ordinary mobilisation work, which had to be carried out to just the same extent in every fortress in the interior. He was not hampered by the concourse of large bodies of field troops, nor by the abuse of the fortress for their benefit. He had not even any difficulties in the way of collecting labour, tools, building materials, or warlike stores of any kind, for the city, with its millions of inhabitants, was capable of meeting the highest demands that could be made on its resources. He had no need to calculate, he only needed to give his orders.

It does not appear that anything was neglected in the mobilisation work, which is surprising enough, seeing how great were the faults committed in this respect in the frontier fortresses. This may well be put down to the initiative of the Empress, who sought to fill her position of Regent like a general, and not only raised new Army Corps and despatched them to the frontier, but also adopted timely measures to provide for the energetic defence of the capital. It was due to her Minister, Clément Duvernois, that an adequate supply of provisions was laid in in time; and it was apparently under the orders of her temporary Ministry for War that the work of putting the forts in a state of defence was quietly commenced at the outbreak of the war without attracting any notice.

There was certainly enough to do. There were no powder magazines, traverses, splinter-proofs, or casemates on the parapets of the forts or of the 94 bastions of the enceinte, which had a length of 21 miles. The latter was traversed by 55 broad openings for roads, and by nine railway cuttings. These gaps had to be so far closed as to form easily defensible entrances; the embankments leading to them across the ditches had to be removed; the glacis had to be finished off; there were drawbridges and tambours to be constructed. The parapets had to be provided with Infantry banquettes, gun banks, and embrasures, and the minimum field of fire had to be provided by clearing the foreground.

This work was already going on when the news of the first unsuccessful actions on the frontier arrived, and the result was a "levée en masse," in order to complete it. It was not confined to the preparation of the existing fortifications, but positions were pre-

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pared in advance of them and in the intervals. Not only had it been found necessary to connect the different forts by means of Infantry and Artillery positions, and to construct obstacles in places where the ground offered facilities for assault, but the weak points of the ring of forts had been discovered, and attempts were made to strengthen them.

From the fortifications of St. Denis, Mont Valérien, the nearest fort on the West, is distant 7½ miles (over 13,000 yards). This front of the city is protected by the Seine, which, bending back at St. Denis, forms the long peninsula of Gennevilliers, and forms a double obstacle in front of the enceinte. Access to the peninsula from the South-West is effectively barred by the strong and excellently-placed Fort of Mont Valérien; but the fortifications cannot prevent an enemy from crossing the outer arm of the Seine, and the city is quite exposed to bombardment from the peninsula. It was therefore necessary to hold it with Infantry, and to prepare a strong position for the latter, which could be held by a small force. The right of this position rested on the entrenched bridge-head at Villeneuve la Garenne, opposite St. Denis, and extended past Gennevilliers and Colombes to La Folie. It consisted of a number of supporting points —strong, semi-permanent redoubts, and fortified edges of villages, etc.—and batteries. Behind it, at Asnières and Courbevoie, bridge-heads were to be constructed; by the addition of several advanced batteries, Fort Mont Valérien was enabled to sweep the ground in front more completely.

There was a second gap in the ring of forts between Mont Valérien and Fort Issy. It extended only over a space of some 7,700 yards, but its danger lay not so much in the inability of the forts to support each other as in the poor protection they afforded to the city. The ground in front of the salient angle of Point du Jour could not be swept sufficiently to prevent the assailant from placing heavy guns there with which the long lines of the enceinte could be effectively enfiladed and taken in reverse.

In order to prevent this, two works were taken in hand on the high, left bank of the Seine, one at Montretout (3,600 yards from Mont Valérien), and one on the steep hill of Brimborion, South of Sèvres (distant 3,000 yards from the first, and 3,500 from Fort Issy).

In the case of the line from St. Denis, through Mont Valérien, to the loop of the Seine at Issy, it was merely a question of completing the line of forts by the construction of intermediate works. But on the South side a very different and more serious problem presented itself. Owing to the increased range and accuracy of heavy guns, the whole line of four forts from Issy to Bicêtre was, as regards position, no longer equal to the requirements of the times. Instead of being built on the northern edge of the plateau of Plessis Piquet, they were built on a low terrace forming part of its northern slope, halfway between the edge of the plateau and the enceinte, which was but 4,400 yards from it. Consequently, the top of the plateau was not commanded by the fortress guns, and afforded an excellent position to the besieger, who was thus always enabled to bring a plunging fire to bear upon the forts.

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This disadvantage was not overlooked in Paris, and it was decided to secure the Northern edge of the plateau by a line of new works, and to carry on the defence there. Two were taken in hand in the Bois de Meudon (Jägerschanze in a clearing South-West of Sevres, and Château Meudon), one at Châtillon, and a fourth at Bagneux, in addition to one small retired supporting point, Notre Dame de Clamart.

It was necessary to continue this position on the low-lying ground between the Eastern edge of the plateau and the left bank of the Seine, for the hill of Hautes Bruyères, which rises West of Villejuif to a height of over 400 feet, was, strange to say, not included in the line of forts. Consequently, Fort Bicêtre, lying nearly 2,000 yards back, at a height of 363 feet, has no clear field of fire to its front; and Fort Ivry, situated on the Eastern terrace of the eminence, at a height of 198 feet, only sweeps the valley of the Seine and the Eastern slopes, but is completely commanded by the heights upon which Villejuif is situated. The hill of Hautes Bruyères and Moulin Saquet, on the ridge between Villejuif and Vitry sur Seine, 2,500 yards apart, were the two obvious points on which to build independent works. The compact Northern part of Vitry could easily be fortified, and connection to the Seine (3,300 yards from the Mill) could be made by means of trenches, since this part could be supported by Fort Ivry.

The whole length of this position, extending from the valley of Sèvres to the upper Seine, at a mean distance of some 2,200 yards from the forts, was about 11 miles; and not only were six independent works to be constructed in it, but, owing to the nature of the foreground, which was in parts very broken and densely wooded, a considerable amount of labour was required in order to provide even the most indispensable field of fire; and for the same reason a large number of troops had to be allowed for outpost duty and the defence of the position.

The supporting points were commenced on 8th August. It was intended to construct provisional works of such strength as would completely take the place of permanent forts, and the time available was estimated at four months. This assumption formed the basis of the project. Only one of these interesting works was so far completed during the siege, as to enable one to form a clear conception of what was intended; this was the redoubt of Hautes Bruyères, which we will therefore briefly describe in order to indicate the characteristics of these improvised works.

The most striking feature of the work, as of all the others built during the war on the South front, was that the bastioned system, which had hitherto been the only one employed by the French Engineers, was abandoned, and that the redoubt might be considered as a faithful reproduction of the normal type of detached work adopted in Prussia a number of years previously. It was in the shape of a lunette with a blunt salient, the gorge having a flat bastioned trace. A ditch, 33 feet wide and 16½ feet deep, had provided earth for a strong rampart, having a command of 13 feet; the parapet was 18¾ feet thick, behind which ran a covered way 16½ feet wide

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and only 4½ feet above the terreplein. Under the covered way, along each of the faces, which were 264 feet long, was a block of casemates. Each of these had a length, from front to rear, of about 21 feet, a width of about 20 feet, and a height of about 10 feet. The floors were 13 feet below the level of the terreplein, so that sufficient room was obtained for a roof of iron rails, masonry, and earth (*i.e.*, about 8 feet). A passage, 18 feet wide, ran along the whole length of the casemates, and from it wooden steps led up to the covered way, whilst the terreplein could be reached by ramps. The whole of the barrack accommodation was of masonry, and passages faced with masonry led to the caponiers at the shoulders and salient. These caponiers were constructed during the siege of upright oak baulks 16 inches thick, the roofs being of the same material and thickness. They were arranged for mitrailleuses and rifles, were very roomy, and appear to have lasted till the surrender.

The gorge parapet was lower and weaker, and under its curtain a second block of barracks was built of wood, with a 12-inch roof of timber; its front faced the gorge ditch. A covered passage connected it with the passage in rear of the casemates under the faces, so that for the men at least a completely covered communication was obtained from the gorge ditch to the front parapet. The main entrance was by means of a ramp from the gorge ditch to the terreplein, the former being reached by a new metalled road, which, however, was never finished. In addition, on the faces and flanks of the work were 13 strong hollow traverses of wood, with 14 gun-banks between them, and in the bottom of the ditch was a palisade. Allowing space for ammunition and provisions, the casemates afforded bomb-proof cover for 500 men; and it must be admitted that a line of works such as this, supported by a strong force in the intervals, would have been well able to take the place of the badly-sited permanent forts against the siege "matériel" available in 1870.

As a matter of fact, the fortune of war, the incapacity of the commanders of the field armies, and the rapid and determined advance of the German Armies on Paris, curtailed the time to exactly six weeks—8th August to 19th September. This reduction however, did not take place suddenly; there was no lack of important events to indicate that the enemy's troops would appear before the capital far sooner than the French had originally supposed. The battles around Metz and the catastrophe of Sedan must have given sufficient cause to hurry on the works with the greatest possible speed, and to be content with less powerful ones, if need be, rather than leave them unfinished, and so abandon the outside position, the great importance of which had been so clearly recognised.

The misfortune of the Sedan especially, in which the French lost their last field army, proved to them how very near was the siege of their capital. They continued the work with renewed energy, and the labourers swarmed round the works like an enormous antheap. But as Viollet le Duc says: "The further the work progressed, the more evident became the insufficiency of that which was finished. Consequently, early in September the Government of National Defence decided to confine itself to the line of forts, and to abandon

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the idea of holding the advanced positions. Only the two redoubts of Châtillon and Montretout (and probably Hautes Bruyères as well) were pushed on vigorously, although it was impossible to overlook the fact that the projects were too extensive to be carried out in their entirety. Besides, no steps were taken to connect these works with the forts, so that they were completely isolated."

From General Vinoy's statement it would appear that the civilian labourers employed on these works did not display that zeal and diligence which alone could ensure their completion in the available time; for when he was sent to the peninsula of Gennevilliers with the 13th Corps on 11th September, he found it necessary to give immediate orders for his troops to be employed on the works from Gennevilliers to Châtillon, and complains bitterly that owing to the change of disposition which took place on the 15th, the important advanced works on the South front were deprived of their best workmen, "and left to the negligent civil labourers, who had only been induced to do a certain amount of hard work by the presence of the troops."

Thus it came about that when the German Armies appeared before Paris, not a single one of the advanced works on the West and South Fronts had been completed; a few such as Hautes Bruyéres, Brimborion ("Kronprinzenschanze"), and Montretout were at any rate defensible; at Châtillon, the work of covering over the casemates had only just been begun; Moulin Saquet and Bagneux had hardly been commenced at all.

On the South-East we have only to mention the advanced position, consisting of shelter trenches and gun-emplacements, which extended from Maisons Alfort, South of Fort Charenton, to the cemetery in front of Le Petit Créteil, the peninsulas of St. Maur and Champigny being quite undefended.

On the East, Forts Nogent, Rosny, Noisy, and Romainville, which defend the edge of the plateau of Montreine, were connected with each other, and on one side with the Marne, on the other with the Ourcq Canal, by means of a continuous line of Infantry and Artillery positions, and in this way the natural strength of the position was taken full advantage of. Mont Avron, situated in front of it, was not occupied.

Intermediate lines were further laid out from Romainville to Fort Aubervilliers and Fort de l'Est at St. Denis. The works of the latter place, which were particularly deficient of overhead cover, were reinforced by a line of small posts in front, a redoubt on the Seine, Le Temps perdu, Château Villetaneuse, and the mill of Stains. The right flank was secured by inundations of the Rouillon and Montfort brooks, and by fortifications at La Courneuve.

So much for the preparation of the works for the siege up till the 19th September. Paris was remarkably strong in Artillery. The guns available in the fortress amounted to 2,218, of which 992 were destined for the forts and the batteries in the intervals, 1,226 for the enceinte and reserve. But as this equipment consisted only in part of good rifled guns, and since the Marine Artillery could not be employed in its proper rôle during the war, it was decided to

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strengthen the Artillery by employing heavy naval guns from the North Coast. In good time 200 16 cm. (6.3 inch) and 23 19 cm. (7.5 inch) guns were got into the fortress; besides these an experimental gun of 24 cm. (9.45 inch), which was on the practice ground at Vincennes, was brought into action on Mont Valérien. This brought the armament up to 2,442 pieces, which is still 185 short of the number (2,627) given by the Generalstabswerk, Vol. II., p. 43; so we can only suppose that these 185 guns were obtained by drawing upon the "guns stored in the other arsenals belonging to the complete equipment necessary to stand a regular siege."[1]

At the same place we are told that 805 guns were handed over to the city, 1,389 to the forts, and that besides them several hundred (presumably about 400) heavy guns were placed at the disposal of the Commandant to reinforce threatened points, together with 460 teams for moving them. It was also found possible to provide a sufficient supply of ammunition—*i.e.*, 500 rounds for per gun for the forts, and 200 per gun for the enceinte—by obtaining large quantities from outside, by the exertions of civilian industry, and by the establishment of a powder mill in Paris.

The mounting of the guns, under the supervision of General Guyod, was entrusted to General Pelissier on the right bank of the Seine, and to General Réné on the left, and was greatly facilitated in the city by the belt line railway, which ran fairly close to the enceinte; but in addition to it, special working lines were laid all round, following the street immediately in rear of the ramparts. On the 20th January, there were mounted on the enceinte 10 19 cm., 44 10 cm., 144 15 cm. (5.9 inch), and in addition 607 rifled 12 and 7 pounders, howitzers, and mortars. By the construction of a parapet, the belt line was utilised to form a continuous interior enceinte.

Owing to the absence of a belt line connecting the forts, the mounting of their guns presented far greater difficulties; but there was not so much work to be done, since the "emergency armament" of 10 position guns was stored in the forts. By the 19th September it was completed. What reinforcements and changes took place during the siege it is impossible to determine. Towards its end it is said that there were among the 1,389 pieces 1 24 cm. (9.45 inch), 17 19 cm. (7.5 inch), 132 16 cm. (6.3 inch), 141 15 cm. (5.9 inch), 211 12 cm. (4.7 inch), rifled guns, as well as 147 heavy mortars, and 3 22 cm. (8.65 inch) coast howitzers.

Further assistance was obtained by employment of the portable floating batteries and gunboats intended for the defence of the Upper Rhine. Some of them were stationed in the Northern ports, some in those of the Mediterranean; they had not been sent to Straszburg in sufficient time, and now there was nothing to prevent their use at Paris. There were 5 floating armoured batteries, with 2 rifled 14 cm. (5.5 inch) guns each, 9 steam gunboats with one 16 cm. (6.3 inch) and one 4-pounder mountain gun each, 6 steam sloops with one 12 cm.

[1] According to Deines (No. 4 of the "Kriegsgeschichtliche Einzelschriften"), there were only a small number available for reinforcing the "emergency armament" of 190 guns for the enceinte on the left bank, and 468 for that on the right, in addition to 10 position guns and 1 field battery for each fort. The demands upon outside arsenals were therefore considerably greater.

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(4.7 inch) each, and, lastly, 6 steamboats and one steam yacht with no armament. Some of these 27 vessels were stationed on the Lower Seine (at the bridge of St. Denis), some on the Upper Seine (at Maisons Alfort).

Of the various steps taken during the siege to utilise the extraordinarily large number of heavy guns available, the moveable heavy batteries and the armoured railway batteries deserve especial mention. The latter were constructed in October, at the suggestion of the Directors of the Orléans Railway, and consisted in the main of trucks armoured all round, upon each of which one heavy gun was mounted, either firing over the armour protection or revolving on a platform with the armour. On account of the excessive weight, the idea of armouring ordinary locomotives had to be abandoned. A motor was formed by connecting two trucks together and placing a traction engine on them, and this vehicle was then armoured. But as this vehicle only travelled at a very low speed, ordinary engines were employed, pushing one armoured truck in front, and connected with another running on a parallel line on the most exposed side.

Not only did the Navy contribute guns towards the defence, but also afforded invaluable assistance in supplying detachments for them. On the 16th August the Minister of Marine suggested that all the Paris forts should be garrisoned by the Navy. Consequently, out of the 8,235 seamen-gunners and fusiliers available, 12 Naval Battalions were formed, and distributed among the six forts of Romainville, Noisy, Rosny, Ivry, Bicêtre, and Montrouge (*i.e.*, three on the East, and three on the South), as well as two large groups of batteries near St. Ouen and on the Montmartre. The Regiment of Marine Artillery (1,700 men) was placed at the disposal of the Minister of War for employment in the works garrisoned by the land Army, and found the gun detachments in Aubervilliers and the works of St. Denis—Fort de l'Est, Double Couronne, and De la Briche; it also found detachments for the Naval guns in the other forts and on the enceinte. During the course of the siege, the work of the Navy became far more extensive than had been originally intended. In all the forts, provisional works, and outside batteries, Naval batteries soon formed the nucleus of the Artillery part of the garrisons. A large number of its officers obtained commands, and its staff of engineers, doctors, and Departmental officers proved to be of great value to the defence. The Naval forces available in Paris came to about 16,000 men, and, in addition to the units already mentioned, consisted of one Naval Battery with 161, the crews of the gunboats, etc., with 507, one regiment of "Marine Fusiliers" with 2,015, different Staffs 80, and 4 battalions of Marines with 3,258, making a total of 15,056[1] men. It is not known how many of the available first 4 batteries of the 15 regiments of Foot Artillery were ordered to Paris, but the number must have been considerable.

The Field Artillery was at first very weak, consisting of only 7 Batteries, 8 Companies of "Artillery Train," 1 Company of

[1] These are the figures given by Heyde and Fröse, (History of the Siege of Paris). By leaving out the "Marine Fusiliers" and a few unimportant differences, Deines arrives at a total of 13,917 men.

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artificiers, and 3 Companies of *ouvriers*. In order to supply the 13th and 14th Corps with Field Artillery, the 7 Batteries were increased to 27; this must have taken place in August. During the siege the number of Field Batteries went up to 124, of which 93 belonged to the land Artillery, 16 to the Navy, 15 to the Garde Mobile. The available stock of 92 "Sortie Batteries" and 4 Mountain Batteries (576 guns) was not enough, the necessary rifled 7-pounders and mitrailleuses were manufactured by private firms. In September the Garde Nationale formed 9 batteries and 20 irregular corps, which served to reinforce the Fortress Artillery. Vinoy states that at the end of the siege the total strength of the Artillery, including the Ordnance and administrative branches, amounted to 817 officers and 17,678 men.

The most difficult task of all was to provide a sufficient force of reliable Infantry for the defence of the enormous frontage of the fortications, particularly since it had been so considerably extended by the improvised works. Of the necessary men there was no lack, and the Parisians did not fail to shout for arms. But there were not enough regular units, the necessity for which increased with the necessity of drawing upon the civil population to assist in the defence. Of the units which were available after the formation of the Rhine Army, the following were utilised—the 35th and 42nd Line Regiments (from Italy); of Depot troops, a large number of the 4th Battalions of the Guards and Line Regiments, a small number of Depot Companies of Chasseurs Battalions and Zouave Regiments, the Depots of the 29th and 59th Line Regiments, and of the 7th, 15th, and 18th Chasseurs Battalions. Fugitives and drafts of all sorts of units merely served to increase the chaos from which a new organisation had to be evolved.

The first organised unit was the 13th Corps of General Vinoy, the formation of which was begun on the 16th August, and, except for the Cavalry Division belonging to it, finished on the 24th. For this purpose the 4th Battalions were grouped in threes, to form *regiments de marche*, of which two constituted a Brigade. The three Divisions of the Corps needed 10 such regiments (numbers 5 to 14), since the 6th Brigade was composed of the 35th and 42nd Line Regiments. Then there were 4 Depot Companies of Chasseurs, 9 Batteries (3 per Division), an Artillery Reserve of 6 Batteries, and 3 Companies of Engineers.

For the formation of a Cavalry Division there were available the 1st and 9th Chasseurs from Algiers, the 8th and 9th Cuirassiers, who had been sent back to make good casualties after Wörth, and 20 5th and 6th Squadrons of Cavalry Regiments of the Line. It was not possible to complete the organisation of the Cavalry Division from the four first-named Regiments by the 24th August, and so the 13th Corps started out without it, when it despatched the 1st Division to Rheims on the 25th, the 2nd and 3rd Divisions to Mézières on the 30th. In spite of the occasional difficulties of his position, Vinoy succeeded in withdrawing his Corps in sufficient time after the battle of Sédan (2nd September), and to collect it at Paris on the 9th September with very slight losses (he gives 350). This Army Corps had

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already acquired some firmness and cohesion through the marches and actions in which it had taken part, and its Infantry, numbering some 30,000 men, formed the nucleus of the garrison of Paris.

The 14th Corps, under General Renault, was formed in the same way as the 13th, except that its three Divisions were composed entirely of *regiments de marche* (Nos. 15 to 26), and had two companies of Chasseurs each, besides only 2 batteries and one section of Engineers. The two Army Corps therefore consisted of:—

13th. 36 Battalions Infantry, 4 Companies Chasseurs, 15 Batteries, 3 Companies Engineers.

14th. 36 Battalions Infantry, 6 Companies Chasseurs, 12 Batteries, 1 Company Engineers.

Total—72 Battalions Infantry, 10 Companies Chasseurs, 27 Batteries, 4 Companies Engineers.

and cannot be estimated at less than 60,000 men.

The troops not told off to the two corps were for the time being only organised in Battalions and Regiments, and in this way 7 more Infantry *regiments de marche* (Nos. 28 and 34 to 39) were formed, also 1 *regiment de marche* of Zouaves and 3 battalions of Chasseurs (Nos. 1 to 3, including the Companies of the 13th and 14th Corps). Of Cavalry 7 *regiments de marche* were formed, of which, however, two, with the two Cuirassier Regiments of the Line were lost to the defence before the investment was carried out.

For Reyan's Cavalry Division, which was originally intended for the 13th Corps, soon ceased to exist. With the addition of the four *regiments de marche* first formed, its regiments were utilised for the formation of two Cavalry Divisions. On the approach of the German Armies, both of them (each consisting of two *regiments de marche* and two of the Line) were sent out into the surrounding country; but only one of them, under General Champéron, with the two regiments of Chasseurs and two *regiments de marche* of Dragoons, returned to Paris; the other under General Reyan, went to Versailles and joined the Army of the Loire. The defence, therefore, only got the benefit of two Line regiments and five *regiments de marche*.

The *regiments de marche* of both Infantry and Cavalry were subsequently designated Line regiments, and received the numbers following those of the regiments that had existed in time of peace. Consequently the garrison eventually contained the following Line regiments of Infantry, 35th, 42nd, 105th to 126th, 128th, 134th to 139th, 4th Zouaves, 21st to 23rd Battalions of Chasseurs, and the Depots of the 29th and 59th Infantry Regiments. The Cavalry Regiments were: the 1st and 9th Chasseurs, 13th, 14th, and 16th Dragoons, 9th Lancers, and 12th Cuirassiers. The total strength of Infantry and Cavalry of the Line must therefore be estimated at about 100,000 men, especially as the strength of those arms, including officers, was 90,474 on the day of the capitulation. But at the commencement of the investment not more than 60,000 of these could be counted as organised troops.

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There were a few other units which may be classed with the Field troops. These were:—

Imperial Horse and Foot Guards in Paris, about...		3,000 men.
Gendarmerie formed on August 12th as an Infantry Regiment of	1,248 men	
And a Cavalry Regiment of	766 „	
Later, this establishment was doubled and the Gendarmes coming in from the Eastern Provinces were formed into a separate *Légion de l'Est*, so that the highest effective strength of the troops formed of Gendarmes may be estimated at		4,000 „
The Customs and Forest officials from the provinces		5,000 „
Marine Infantry		5,000 „
Making a total increase of		17,000 men.

On the issue of the Imperial decree of the 16th July, ordering the immediate organisation of the Garde Mobile of the first 3 Army Corps, the 18 Battalions of the Department of the Seine were, of course, the first to be called out. It was hoped that after receiving some military training they could be used to reinforce the Rhine Army, and so they were sent to the Camp of Châlons. But when the news of the first reverses on the frontier came in, they were inclined to get mutinous, and demanded to be sent back to Paris, as they were only obliged to defend their own homes. They were recalled on the 18th August, and accommodated in the Camp of St. Maur in order to be put through the absolutely indispensable rudiments of drill. They formed the nucleus of the Gardes Mobiles who took part in the defence of Paris. These latter poured in during the early part of September, and formed 92 battalions, varying in strength between 700 and 1,700 men each. This mass of about 115,000 men was devoid of all organisation and training, and was consequently during the first period, no more than a useless impediment. How to house it and keep it occupied was a matter of some difficulty, and the problem of its further development caused the Government of National Defence to commit the almost disastrous blunder of reducing all the officers on the 19th September, the very day the investment began, and ordering a fresh election to be held.

It was not until the reorganisation of the Army of defence in the beginning of November that the Gardes Mobiles were properly organised in accordance with tactical requirements. In response to a proclamation of the Minister of the Interior, dated the 12th August, 40 or 50 irregular Corps were formed, which were given the same standing as the Gardes Mobiles by decree of 27th August. They reached a strength of 15,000 men, and consisted of Infantry and mounted troops, 20 companies of Auxiliary Artillery, and one "Corps du génie volontaire."

Finally, we must mention the "Garde nationale sédentaire." This body began in a small way, but eventually assumed immense

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proportions; it was of very little use to the defence, but owing to its lack of discipline, it developed within itself the germs of those passions which later on afforded so terrible a proof of the mistake made in creating it. On the 12th August the Government could no longer oppose the demands of the Liberals, and permitted the formation of the Garde Nationale for the threatened departments and the towns in which a state of siege had been declared. After that date the organisation of the battalions was begun in Paris, and on 6th September it was decreed that 60 of them, with a strength of 1,500 each, might be raised. But soon a demand was made upon the authorities to enter on the rolls all men capable of bearing arms between the ages of 25 and 35, and to call upon them for military service. The number of battalions grew apace; in October it amounted to 266, with a strength probably of not less than 370,000 men. We must not forget the units of the special arms which were afterwards formed from the ranks of the Garde Nationale, a Legion of Cavalry, one of Artillery with 100 guns, an auxiliary Engineer Corps (composed of architects, etc., under Alphand and Viollet le Duc), and an auxiliary Miners' Corps, about 150 to 200 strong, consisting of the quarrymen.

The lack of technical troops was very marked. There were available only six companies of Engineers and two of Pontoon troops, besides a detachment of "sapeurs conducteurs"; five new companies were raised, and much assistance was derived from the technical troops of the Garde Nationale, particularly as they were under such able commanders.

These data are not absolutely reliable, but we can nevertheless form the following estimate of the garrison available at the time of the investment:—

For employment in front of the works, the 13th and 14th

Corps	60,000 men.
Naval forces	5,000 men.
Other troops	12,000 men.
	77,000 men.
	With 162 guns.

Available for garrison duty, troops not yet fully organised of

The Line	40,000 men.
Garde Mobile	115,000 „
Irregular Corps	15,000 „
	170,000 „

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Naval Artillery and technical troops ...	11,000 men.
Field and Fortress Artillery, Engineers, "Sapeurs Pompiers," and Transport ...	22,000 „ (about)
	33,000 „
Available for manning the enceinte, 60 battalions Garde Nationale	90,000 men.

This makes a grand total of 360,000 men at the commencement of the investment. By the continual organisation of fresh battalions of Garde Nationale, it eventually reached 650,000. We must now briefly indicate the events which preceded the investment.

On 17th August, General Trochu was appointed Governor of Paris; he selected General Schmitz for his Chief of the Staff. On the 20th August, by Imperial decree, a Defence Committee was appointed, which was ordered to meet daily at the Ministry of War, and receive reports as to the progress of works and armament, and the state of the stock of ammunition and provisions. It was to report daily to the Minister of War, who in turn reported to the Council of Ministers. This Committee continued, with a few changes in personnel after the fall of the Empire, and Trochu retained his post of Governor.

After the return of the 13th Corps on the 9th September, it was possible to consider the formation of an Army of Defence which might be employed outside the works. The 13th and 14th Army Corps were selected for this purpose. The remaining available forces were employed for the manning of the forts and enceinte, generally speaking as shown in the above table, but their further organisation was not neglected. Since the works in the advanced position on the South front were not yet completed, no permanent garrison was allotted to them.

The enceinte was divided into nine sections; a General or Admiral was put in charge of each as Commandant, and was directly responsible to the Governor. He was given a Staff of from 5 to 10 officers; and the battalions of the Garde Nationale raised in the adjoining quarter of the city were told off to the defence of the section. Sufficient men from the Artillery or the Navy were detailed to man the guns

Each fort was placed under the orders of a Commandant, with a special Staff; the Engineer works were supervised by a Field Officer of the Engineers, assisted by one officer, one or two foremen, and 50 to 100 Engineers. In the forts not garrisoned by the Navy, the gun detachments were in charge of a Field Officer of the Artillery; there were further 2 telegraph officials in each fort to attend to the telegraphic communication.

Some of the Commandants of the forts were under the immediate command of the Governor, whilst others were combined in groups, each with its own Commander. The following table gives the details of this arrangement:—

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Group.	Forts and Works.	Commander.	Garrison.
St. Denis.	de la Briche. Double Couronne. de l'Est. Aubervilliers. Improvised works in the Intervals and in front Batteries at St. Ouen.	General Bellemare.	96 Companies (later 3 Regiments), of 4th Battalions. 12 Battalions Parisian Gardes Mobiles; some Irregulars and the necessary Marine Artillery. Total strength about 25,000.
Second Group.	Romainville. Noisy. Rosny.	Rear-Admiral Saisset.	Garrisons of Forts. 3 Battalions Seamen. 3 " Marine Infantry. 1 " " Fusiliers. Detachments of Marine Artillery and of Engineers. 5,700 men. Garrisons of intermediate and advanced posts: Composed of Fourth Infantry Battalions, Gardes Mobiles and Irregulars. 6,800 men. Total, 12,500 men.
Third Group.	Nogent. Vincennes. Charenton. Redoubts of Graville and Faisanderie.	General Ribourt.	Not Known.
Fourth Group.	Ivry. Bicêtre. Montrouge.	Rear-Admiral Pothuau.	Garrisons of Forts only;— 4 Battalions Seamen. 1 Battalion Marine Infantry. 2 Battalions Marine Fusiliers. Marine Artillery and Detachments of Engineers. 5,500 men.

Independent Forts:—

Fort.	Commander.	Garrison.
Vanves.	Col. Cretin.	Artillery, Engineers, Infantry. Gardes Mobiles. 2,300 men.
Issy.	Col. Guichard.	Similar to Vanves. 2,700 men.
Mont Valérien and Advanced Works.	General Noel.	Not Known.

Thus there were 7 Commandants under the immediate command of the Governor, making, with the 9 Section Commanders of the enceinte, 16.

It was only on the North and East Fronts that special troops were placed at the disposal of the Section Commanders for the defence of the intervals and of the ground in front. On the West and South, the mobile troops had to undertake this duty. On the 10th September it was reported by telegraph that the German Third Army was deploying at Dormans, Orbais, and Sézanne, 56 miles from Paris; its Cavalry, having got beyond Vieils Maisons, was only

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43 miles away, and so the Governor considered that the time had come to occupy these two fronts. On the 11th, the 13th Corps was moved to the peninsula of Gennevilliers, in order to close the large gap between Mont Valérien and St. Denis. It was considered to be the most dangerous, since the works were still in a very unfinished state, and the passage of the Seine could only be opposed by a strong force of Infantry. It has already been mentioned that General Vinoy utilised this opportunity to set his men to work at once. The civilian labourers had been working at the fortifications in quite a leisurely manner, and their energy was considerably increased by the strong working parties of soldiers. The General wished to finish these works in some style, though it might not be the most perfect, and at least to make them defensible. This he did succeed in doing with some of them.

The two Cavalry divisions were probably sent out at the same time. On the 13th their patrols met the enemy at Meaux, 22 miles from Paris, but no serious engagement took place.

But on September 15th, a telegram from the stationmaster at Joinville le Pont, on the Marne, stated that hostile columns, numbering some 10,000 men, were approaching the place. It was a mistake; this place, situated opposite St. Maur, far up in the bend of the Marne, was not in any danger at all; it was Joinville-sur-Seine, more than 25 miles away. But this report was sufficient to make the Governor change his opinion as to the threatened front, and to lose faith in the power of the forts to afford the necessary protection. He ordered General Vinoy to abandon his position, and to post the 13th Corps between Vincennes and Charenton. This necessitated a march of some 10 miles. But the troops had first to be withdrawn from the works and collected. The route lay straight through the city, and delays at the gates were unavoidable, as they had been narrowed down to less than 10 feet. Consequently, although the Army Corps marched off on the morning of the 15th, it was not completely assembled at Vincennes until 2 a.m. on the 16th. But nothing was known about the enemy here, and the 13th Corps remained unmolested in its bivouacs.

On the 14th, General Trochu had ridden round the position on the plateau of Plessis Piquet, and decided to hold it, although the fortifications were still incomplete. The 14th Corps was told off to this duty, and advanced on the morning of the 17th up to the line Clamart-Bagneux.

Meanwhile, after their first hurried encounter with the enemy's mounted troops, the Cavalry regiments had returned, Champéron's division bivouacing at Vincennes and on the Champ de Mars, whilst Réyan's reached Versailles and left Paris for good and all. The Governor's sources of information were now reduced to the reports of the officials and inhabitants whose homes were approached by the enemy. In other respects it was considered that enough had been done by rendering strategically important railways useless by timely destruction of bridges, tunnels, etc.

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Three railways might eventually be made use of by the German Army, but for the time being they were all of them blocked by fortresses, the line Hagenau—Nancy—Châlons—Epernay—Meaux—Paris by Toul; Saarbrücken (or Saargemünd)—Metz—Thionville—Sédan—Mezières—Reims—Soissons—Paris by Metz, Thionville, and Soissons; the branch line Reims—Laon—La Fère—Creil—Paris, by Laon and La Fère. After the fall of Soissons it would also be possible to transfer to the second line from the first by the branch lines from Châlons and Epernay to Reims. It was considered necessary to add to the security afforded by the fortresses by thorough-going demolitions. On the first line, not only was the tunnel of Nanteuil blown in, but all the bridges over the Marne and Ourcq between Epernay and Paris, were destroyed. On the second line, between Soissons and Paris, the tunnel near Vierzy, a deep rock-cutting near Villers Cotherêts, and a masonry road tunnel at Mitry were demolished; the destruction of the tunnel at Nanteuil le Haudouin was unsuccessful, as the upper arch was unhurt. On the third line, the bridge over the Oise, between Chantilly and Creil, was blown up and completely destroyed. But communication with Lyon and Belfort was also interrupted at Montereau, so that only the railroads to Orléans and the West were left open to the fortress, and these fell into the hands of the Germans in a few days.

In this manner Paris awaited the rapidly approaching enemy and the investment. The Government had sent three of its members to Tours to organise the defence in the provinces. It was from that direction that relief was expected. In the town the first steps were taken towards arranging for the economical consumption of the meat supply, the daily rate being fixed at 100 head of oxen; all cattle for slaughter was taken charge of by the authorities, and a tariff for the sale of meat was fixed.[1]

DISCUSSION.

Paris had a completely finished enceinte, and a ring of extraordinarily large and well-equipped forts. The works were all absolutely unscaleable, and their armament was complete, in so far as it was intended to resist assault. On the whole perimeter, from St. Denis to the Seine at Issy, the intervals were closed by defensible lines of entrenchments; the main defensive position had been completed in a suitable manner, and had even in parts—on the North and North-East—been reinforced by advanced posts. But in those parts, where in time of peace considerable gaps and deficiencies had been allowed to occur, it had been found impossible to make them good in anything approaching a satisfactory manner during the six weeks available after the outbreak of hostilities. In the gap between St. Denis and Mont Valérien not a single supporting point had been completed, and the flat and open peninsula of Gennevilliers was particularly exposed, since it was completely commanded by the

[1] On the 19th September they were in possession of 30,000 oxen, 6,000 pigs, and 180,000 sheep.

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opposite bank of the Seine, and except for the barrier formed by the river, presented hardly any features favourable to a stubborn defence. The enceinte, being 7,700 yards distant from the Seine at Bezons and Argenteuil, could at the very best assist in the defence of the bridge-heads of Asnières and Courbevoie; but it was unable to prevent the enemy from gaining a foothold on the peninsula, or from establishing his heavy batteries upon it. Apart from their effect against the city, however, the latter would be able to afford considerable support to an attack upon St. Denis, by enfilade and reverse fire, and paralyse the defence of the Northern forts in a very short time; they would also be able to act against Mont Valérien, and assist in establishing against this, the strongest and most important supporting point of the defence, an Artillery position enveloping it on an arc of over 200 degress.

It is therefore quite comprehensible that the Governor was particularly concerned about the safety of the peninsula of Gennevilliers, and sought to secure it by the provision of an adequate garrison. But he could have managed to do so with a far smaller force if the defence had been properly supplemented by fortifications As the main supporting point on the line La Folie, Colombes, Gennevilliers, Villeneuve, a redoubt on a bastioned trace had been begun on the West of Gennevilliers, of which the Infantry parapet had been completed. But it was not secure against assault, since the counterscarp wall was only partly finished, and it did not meet the chief object for which it was constructed, because the cavalier for the heavy guns had not yet been begun; the casemates upon which the latter was to stand were not even finished. The two redoubts at Colombes and Villeneuve were also unfinished, particularly as regards their security against assault, although owing to their less pretentious design, it was found possible in the last few days to make them reasonably defensible; this was achieved by providing them with makeshift substitutes of the parts that were still lacking, particularly in the way of caponiers, and was probably due to the initiative of General Vinoy.

The position was completed by the fortification of Gennevilliers and Colombes, and the erection of a few batteries.

It was evidently intended to build a substitute for a fort with provisional means in the middle of this position, between Gennevilliers and Colombes, which should be able to oppose the Artillery positions on the right bank; the remaining works can justly be considered as semi-permanent intermediate works. This was too ambitious a project, and it was all the more faulty, because the object of denying the passage of the Seine to the enemy could be attained by simpler means. It could only be a case of defeating an attempt to seize the peninsula by surprise; there could be no likelihood of the regular siege being commenced on this side, or of its being prepared by powerful batteries on the opposite bank. The double obstacle formed by the Seine should have been a sufficient answer to the supposition that the besieger would seek to decide the combat at this point.

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The position on the plateau of Plessis Piquet should also be considered, not as an advanced position, but as a part of the line of forts constructed with provisional means. It was recognised that the line from Issy to Ivry was quite untenable as the main defensive position against a strong Artillery position on the commanding points immediately in front, and an attempt was made to build new forts on these points as quickly as possible. Here the intention was correct enough, but the calculation was wrong.

From these abortive attempts on the part of the Engineer Officers to provide an efficient substitute for permanent works with provisional means, we can draw very important conclusions. For—to confine ourselves to this side of the question alone—it has been attempted to prove from other events of the past that positions fortified in the shortest possible time by provisional means could be made as strong as works executed in time of peace. If such a thing were conceivable, surely there were in Paris sufficient means available to produce the best results in a minimum of time. Not a single item of all the materials required for buildings and fortifications but could have been supplied without delay; and in spite of this, not one of the works was completed in six weeks—very few of them were even passably defensible, many were hardly begun; but mounting the heavy guns, completing their interior details, supplying them with ammunition, provisions, hospital necessaries, etc., was still absolutely out of the question.

The following is a rough estimate for the works, designed according to the Prussian type.

The redoubt of Hautes Bruyères required a total excavation of 2,120,000 cubic feet, and assuming that all cover below the level of the ground was to consist of masonry with iron roofs, and that there was to be a wall in the ditch all round the work as an obstacle, the total masonry amounted to 460,000 cubic feet. Since in many cases the earth had to be moved several times, this gives 30,000 days' work for the earthworks, and 13,000 for masonry. As the other work can be fitted in at the proper time, it need not be taken into consideration.

By putting on about 1,700 men for the earthwork, and 600 bricklayers, who would have to be housed on the spot, the building might be finished in three weeks. But as the different buildings can not all be undertaken at the same time, but some of them have to wait until others have progressed sufficiently far, the problem is in reality very different.

The excavations for the passages and casemates have to be commenced first. This entails some 460,000 cubic feet of excavation, some of which has to be moved again, so as not to put too much weight on the steep walls; 770 men can be employed on this work, which will therefore take about 8½ days. Only then can the bricklayers begin their work, which here comes to some 246,750 cubic feet, at which 400 men can be employed, requiring 17½ days for its execution. To this we must add at least one day for laying the iron roof, making 18½ days. During this time the excavation of the ditch

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might be started, but could only be carried on so far as not to interfere with the bricklayers' work; under the circumstances, about 423,000 cubic feet could be got out. Now the ditch could be finished off—at least on the escarp side—and the earth so gained used for the parapet, in order to obtain the necessary room for the flanking arrangements and the detached wall. This may amount to 883,000 cubic feet, which can be managed within 9 days by the 1,400 men it is possible to put on. Not before this is done can the masonry work in the ditch be commenced, amounting to about 212,000 cubic feet. This can be managed by 400 bricklayers in 15 days, during which time the remainder of the earthwork can be completed.

Allowing only one day for the preliminary work we get a total time of $8\frac{1}{2} + 18\frac{1}{2} + 9 + 15 + 1 = 52$ days. In the 42 days available, it was therefore hardly possible to complete this work according to the project. Of course, a work like the redoubt of Gennevilliers would require more time, if only on account of the increase in the masonry due to the counterscarp wall, requiring a profile 2 to $2\frac{1}{2}$ times that of the detached wall.

The excuse that more time was reckoned on may be met by pointing out that when beginning provisional works, it is hardly ever possible to count upon having a definite period available. One can hope to have so many weeks' time, one can even take it as probable; but one can never rely upon it for a certainty, and should therefore never reckon with it. It is therefore a mistake—albeit one that has been made times without number—to draw up and commence projects which require to be completely executed before they can be utilised. In building forts in time of war, one must follow the principle that has long been recognised in field fortification, that one must build sword in hand, with one eye on the enemy. Then one will construct a work that can be made use of at any time. It certainly requires well considered and skilful arrangements to carry on the work in such a manner that it can be made completely defensible in a few days—and these will always be available after the enemy's approach is reported. This pre-supposes the existence of a progressive series of types, such as we have long ago settled upon, on a small scale, in the profiles of our shelter trenches; and this always imposes considerations and hindrances upon the superintendent of the work which do not exactly assist progress.

We should therefore never make our schemes for provisional defences too ambitious; and in seeking to provide substitutes for permanent works, we should never try to produce mere copies of them. The difference of the materials alone suggests the desirability of giving them a different shape, and it is neither correct style, nor is it justified in practice, to rest content with a copy. The redoubt of Gennevilliers was merely an imitation of the French type of fort; and the German normal types, according to which the redoubts of Châtillon, Montretout, Hautes Bruyères, etc., were constructed were merely German types of forts, carried out in lighter materials. We Germans were at that time following the same wrong track.

How provisional works should be built is a technical question which is outside the scope of this discussion, and about which a good

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deal has lately been written, the best emanating from the pen of Lieut.-Colonel R. Wagner. The supplementary works of Paris teach us that the additional works intended to be built during the preparatory period before the siege, should be executed according to the same principles, and that everything should at the first be restricted to modest dimensions. There is yet a word to be said about the tactical details of the French position, which Viollet le Duc quite correctly describes as incomplete.

He points out the great importance of the heights between Garches and Bougival, and maintains that they should have been provided with field defences between La Jonchère and La Bergerie. This would have constituted an advanced position, just capable of being supported by Mont Valérien and the batteries outside it, which would have rendered the seizure of Versailles impossible. Moreover, the redoubts of Montretout and Brimborion, being thus placed in the re-entering angle of the whole position, would have received that protection which their isolated position in front of the river obstacle rendered necessary. They would then, in conjunction with the defensive positions at Meudon and La Bergerie, have been able to render good service.

We will now turn to the organisation of the defence.

The larger the fortress, the greater the number, extent, and distance between the works, and the mass of stores and armed forces available for the defence, the more difficult the suitable accommodation, feeding, equipment, and leading of these troops, the more must the Governor, upon whom rests the responsibility, strive to keep his eye fixed upon the large and decisive issue, and not waste his time and strength on matters which, though possibly of great importance, yet only concern individual parts of his command, and therefore must be regarded as details. This need must be met by organisation, by providing him with a numerous and well-trained General Staff, the duty of which is to arrange and keep ready for him all the numerous threads which converge in his office. Secondly, all the work outside must be suitably distributed from top to bottom, and be entrusted to individual officers directly responsible to him The Staff of General Trochu was undoubtedly numerous enough, but the organisation of the outside work was as clumsy as could be. We may assume that the commissariat and hospital services, etc., were under a central authority; but of the other branches of the service this was only the case with the Engineers, of whom General de Chabaud la Tour was in supreme control. He had arranged for three sections, each of which comprised a part of the line of forts, and the part of the enceinte in rear of it. The first, on the East, extended from Charenton to Romainville, under General Malcor; the second, on the North and West, extending from Aubervilliers to Mont Valérien, was under General Duboys-Fresney; and the third, comprising the South fronts, was under General Javain. The Engineer Staff Officers stationed in each fort very suitably formed the next link in the chain. The division of the command into the above-mentioned sections also met the local requirements. Further, there was nothing to prevent the fronts on which the attack might take place from being placed under a

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separate Commander, as was eventually done in January, 1871.

It would have been natural to retain this organisation originally devised for Engineer purposes, for Artillery and tactical work as well. But even for the former it was different—the Artillery command, under General Gujod, was divided into two sections only, that on the right bank under General Pelissier, and that on the left under General Réné. The relative positions of these "Artillery Commanders" to the Artillery and Naval garrisons of the forts and of the enceinte, and to the Section Commanders concerned, is not known. The question is not a simple one, since the number of the latter amounted to 16, and the Commanders of the mobile troops were also empowered to issue orders to the Artillery in the forts, with a view to obtaining their assistance when assuming the offensive.

Moreover, in arranging the tactical sub-division, larger units had been entirely dispensed with, and 9 independent Commandants had been appointed in the enceinte, and 7 in the line of forts. Thus the sub-division of the town did not even correspond to that of the line of forts, and to stil further increase the confusion, the outer sections on the South side were not provided with special "Section Garrisons." Consequently, the garrisons of the forts, and the troops told off to defend the intervals and the foreground, were under different and mutually independent Commanders. This state of affairs must have given rise to very great and unnecessary friction; and to have so large a number of independent Commanders under his immediate orders must have entailed a vast amount of unnecessary extra work for the Governor.

It will always be necessary to divide the extensive foreground and the line of forts of a modern fortress into a number of "sub-sections," and to determine their boundaries in accordance with the nature of the ground; it will be natural to seek to retain the same sub-division for all the different arms and services, and, as far as possible to unite the sub-sections in sections, each under an independent Commander. Under the different Commanders will be the senior officers of the various branches, who will be represented at headquarters by their respective senior officers who are on the Staff of the Governor. Besides the garrisons of the forts, each sub-section will have its own permanent "Sub-section Garrison," which will be responsible for the security of the intervals and of the immediate foreground. The larger "Sections," formed by a number of Sub-sections, will have a separate "Section Reserve," under the direct command of the Section Commander. This organisation of the line of forts will be adhered to until it is known on which front the main attack is going to take place, when the whole force of the General Reserve and the Artillery Reserve will be concentrated at that point, which will probably lead to a change in the person and rank of the Commander of the section in question.[1]

[1] In Germany, the only guns permanently mounted in the works in time of peace are those of the "Sicherheits Armirung"—Emergency Armament. These are supposed to be merely enough to prevent the position being taken at the first rush. When the works are prepared for defence, sufficient guns are brought up into the line of forts, either in the permanent works, or in previously selected positions, to enable the defence to be carried on until the enemy's line of attack is apparent. Then the artillery Reserve is brought up on the threatened front. This is of

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It will also be advisable to put the enceinte under an independent Commander, although its extent will render it necessary to divide it up into sections; they will probably be fewer in number than those of the line of forts, but their boundaries should coincide, as far as possible, with those of the latter.

The excessive zeal with which the preparations for the defence of Paris were carried out, was also apparent in the destruction of the lines of communication. Just as the supplementary works were never completed, because it was considered impossible to make them too strong, so the scale on which impediments were put in the way of the besieger was more extensive than was either necessary or justifiable. The thorough destruction of the tunnels of Vierzy and Nanteuil would have been quite sufficient to stop all traffic on the lines from Straszburg and Metz. The repair of the former was not finished until the 18th November; the difficulties at Nanteuil were not overcome until the 23rd. The destruction of the bridge over the Oise, on the line Chantilly-Paris, also proved successful, as the temporary wooden bridge was not completed until the 22nd December. These railways thus remained blocked long after the fortresses commanding them had fallen. But the case of the line between Epernay and Paris was different. Here it was thought necessary to demolish every piece of architecture, and, unfortunately, on this line there were a great many; at Nanteuil there were three, and at Meaux no less than five railway bridges. Even this was not enough. All the road-bridges over the Marne and the Ourcq Canal, as far as Meaux, and all the bridges over the upper Seine as far as Corbeil, were blown up; that at Melun only escaped the same fate through the arrival of the German troops. It is well known that no considerable loss of time is incurred in replacing road bridges by military bridges; after that, one can take one's own time about building new ones. But even in 1870 railway bridges could be repaired without excessive loss of time, provided the spans were not too great; at any rate, it did not take so long as the opening up of the tunnels beyond them. Nowadays, when the Railway troops are provided with sufficient material for the construction of considerable lengths of railway bridges, the destruction of bridges like those over the Marne and the Ourcq Canal, would be still less justifiable than it was in 1870.

Whilst in this manner excessive sacrifices were imposed upon the country in order to retard the advance of the enemy, too little was done towards obtaining reliable information as to his strength, intentions, and equipment. The numerous demolitions would only have been justified if there had been troops available to make use of the obstacles, in order to check the enemy's advance, and oblige him to deploy his forces behind the Cavalry screen. But only the 8 Cavalry regiments were sent out against him, and they imagined they had done their duty when they had captured two wounded Hussars about 25 miles away from the fortress. With this trophy they re-

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course to a great extent a measure of economy, since it would be unnecessary and too expensive to permanently mount on each front sufficient guns to withstand a regular siege. The proportion of the full armament permanently mounted as emergency armament depends of course, among other things, upon the distance of the fortress from the frontier.—*M.H.C.B.*

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turned to Paris, without even having come in touch with the enemy. Besides them the enemy only found his progress opposed by a party of Franc-Tireurs, who had occupied Bec Oiseau and Montcerf, and ran away when a dismounted squadron of Hussars opened fire on them. The nature of the opposition offered to the passage of the Seine we shall see later. Of any organisation of the outpost service in the distant foreground, in the way arranged by Denfert at Belfort, there was no question at all.

On the other hand, as in other French fortresses, the inhabitants of the surrounding country were invited to take refuge within the city; they were in this case, however, cautioned to burn all the provisions which they were unable to bring with them. In this way it was intended to create a further obstacle, in the form of a devastated country, deserted by its inhabitants, where the enemy would be obliged to house his troops without being able to feed them.

Not only did this measure produce very little effect upon the besieger, who could, of course, only be subjected to want for a short time, but the evil consequences to the besieged were in many ways soon apparent. As far as they were protected by the forts, the inhabitants of the villages could have remained in them without any danger, and could have afforded invaluable assistance to the garrison by continuing to cultivate their gardens and fields. Instead of this, they fled to the city in a state of panic, with no more than the bare necessaries of life, and often with a lot of useless stuff; there they spread fear and disorder, and became a burden to the authorities. But in the villages and fields which they had deserted, the troops, particularly the mobiles of the Seine and the irregulars, found a welcome opportunity to satisfy their desire for plunder and destruction.

In this manner the country around Paris was most uselessly plundered and devastated. This went on unchecked, and so contributed not a little to undermine discipline and demoralise the Army.

(b). How the investment was carried out.

"Since the French Army had laid down its arms at Sédan, whilst the captured Emperor had declined to enter upon negotiations for peace, it was in the interest of the victor to immediately resume the interrupted advance on Paris." Since, for the time being, XI. Corps and the I. Bavarian Corps, as well as the 4th Cavalry Division, had to be left before Sédan, and since the Württemberg Field Division was detached from the Third Army to cover Reims and its vicinity, there only remained for the attack of Paris the following troops:—

Third Army.

V. Corps, 17,625 Infantry, 2,075 Cavalry, 84 guns.
VI. Corps, 23, 953 Infantry, 1,278 Cavalry, 84 guns.
II. Bavarian Corps, 18,848 Infantry, 3,969 Cavalry, 96 guns.
2nd Cav. Divn., 3,624 Cavalry, 12 guns.

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Army of the Meuse.

IV. Corps, 21,575 Infantry, 1,909 Cavalry, 84 guns.
Guards' Corps, 19,673 Infantry, 2,092 Cavalry, 90 guns.
XII. Corps, 23,382 Infantry, 3,558 Cavalry, 96 guns.
5th Cav. Divn., 4,147 Cavalry, 12 guns.
6th Cav. Divn., 2,154 Cavalry, 6 guns.

6 Corps, 4 Cav. Divns., 125,056 Infantry, 24,806 Cavy. 564 guns.[1]

By order of His Majesty, dated 3rd September, the advance was made on a broad front, with the Third Army on the left, the Army of the Meuse on the right. For the whole distance, amounting to some 125 miles, no obstacles were met with; there were no large rivers or fortresses to impede their progress, and the French 13th Corps, which was this side of Rethel, got out of the way as quickly as possible. Consequently, on 10th September, the Third Army deployed, 56 miles from Paris, on the line Dormans, Orbais, Sézanne, with a frontage of 28 miles, the VI. Corps being in advance at Château Thierry. Being somewhat ahead of the Army of the Meuse, it waited here for it to come up.

By the 7th September, the further advance had been so far decided upon that the Army of the Meuse was ordered to advance on the North fronts of Paris, with its left wing North of the road in the Marne Valley, extending to its right according to the reports sent in by the Cavalry regarding the movements of the enemy; the Third Army was to march on the South front, its right wing making use of the road in the valley of the Marne.

On 15th September the Third Army was on the line Meaux, Farmoutiers, Rozoy (22 to 25 miles distant from Paris), covering a frontage of some 19 miles, with the 2nd Cavalry Division at Tournan. The 4th Hussars were in advance at Brie Comte Robert, and were ordered to reconnoitre the Seine from Corbeil to Choisy le Roi; in doing so they found the bridges at Corbeil, Villeneuve St. Georges, and Choisy demolished, and the roads blocked in various places by abattis and cuts. The outposts were not only fired upon from the opposite bank, but they also found the village of Draveil, on the right bank, occupied by Gardes Mobiles, who only gave way before the fire of dismounted troops. At Créteil a detachment sent out from Fort Charenton was met with, of which 10 men were captured; but an attempt to ford the river was defeated by the fire of a detachment of the enemy at Juvisy.

The Army of the Meuse was, on the 15th, at Villers Cotterêts, La Ferté Milon, and Monthiers—that is to say, a day's march further back; both its Cavalry Divisions were pushed forward to Nanteuil les Haudouin and Senlis, where they drove off a body of Franc-tireurs. The day before, the 7th Division had, *en passant*, called upon the Commandant of Soissons to surrender, but in vain, and had exchanged a few shots with the garrison, wisely abstaining from

[1] These figures were obtained from the return of strengths given in the "Generalstabswerk" for the 22nd August, and from the Casualty Returns for the intervening engagements. Heyde and Fröse give considerably smaller numbers, amounting to 111,234 Infantry, 22,209 Cavalry and 564 guns. The two Battalions which were at first detached from the II. Bavarian Corps have not been deducted.

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bombarding the place with field guns, since at Toul, on the 16th August, the Commander had been convinced of the futility of these unprepared attempts against fortresses.

On the 16th September, the 2nd Cavalry Division advanced to Brie Comte Robert; from here a Horse Battery was sent on ahead to Vigneux, which destroyed the railway bridge over the Orge, on the far side of the Seine; and in pursuing a party of French Cavalry, one squadron got as far as Maisons Alfort, near Fort Charenton. Behind the Cavalry, the Third Army occupied the following positions—the VI Corps at Meaux, with the advance guard at Lagny, the G.O.C. being engaged in arranging for the temporary reconstruction of the most indispensable bridges between Lagny and Trilport; the V. Corps at Tournan and Fontenay, advance guard at Ozouer la Ferriere and Chevry, its patrols meeting with no enemy as far as Champigny; the II. Bavarian Corps at Moissi-Cramayel, advance guard at Lieusant and St. Germain les Corbeil, on the Seine, across which a military bridge was thrown during the night of the 16-17th September, under the protection of two battalions, which crossed in boats. On the left wing the 10th Cavalry Brigade had arrived, and picked up connection with the Bavarians at Melun, being no longer required at Sédan.

The three Corps of the Third Army surrounded the South-East of the city, at a distance of 15 to 19 miles from the line of forts on a front of some 30 miles. The 4th Cavalry Division was detached to the South to cover the flank; but the early arrival of the Württemberg Division was to be expected, which meant an increase of 13,296 Infantry, 1,116 Cavalry, and 58 guns.

Advancing in front of the Army of the Meuse, the 16th Cavalry Division reached Beaumont sur Oise on the 16th September; its patrols got as far as St. Denis, meeting the enemy's outposts at St. Brice and Ecouen[1], and observed French camps at Montmagny, and between Pierrefitte and St. Denis. The 5th Cavalry Division reached Dammartin, meeting with fairly strong detachments of the enemy's Cavalry at Arnonville and Le Blanc Mesnil.

The IV. Corps reached Nanteuil le Haudouin, the Guards Acy en Multien, and the XII. Lizy sur Ourcq, where the inhabitants were made to repair the demolished bridge. The Army was thus closed up, on a front of some 12½ miles, at a distance of 22 miles from the forts. By pushing the Cavalry Divisions far to the front, the arc on which the German Armies were disposed was extended to about 70 miles, just about half of the complete circle enclosing the city at this distance (140 miles). If the line of investment could be pushed up to within 2½ miles of the line of forts, the semi-circle would be reduced to 25 miles, and to completely hold the circumference, 25 miles more would remain to be occupied.

The necessary directions for the execution of this movement had been issued by Supreme Headquarters on the 15th. The three Corps of the Army of the Meuse were to occupy Argenteuil in force, and surround the capital, on the right banks of the Seine and Marne, on the 19th, whilst the two Cavalry Divisions were to attempt to

[1] 5 miles North of St. Denis. *M.H.C.B.*

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get in touch with the Third Army by way of Poissy. "It being improbable that the enemy would advance out of Paris to make an attack, the Third Army was directed to approach the City, independently of the progress of the Army of the Meuse, on the left bank of the Seine and Marne, and to extend to the left as the Corps coming up from Sédan made it possible to do so. The duty of Cavalry of the Third Army was partly to establish communication with the Army of the Meuse to the westward, and partly to obtain reliable information about the concentration of troops taking place on the Loire. In case of the relief of Paris being attempted from that direction, the main force of the Third Army was to advance a couple of days' march against the enemy, in order to be able to repulse him at a sufficient distance from the line of investment. The latter was to be established out of range of the fortress guns, but as close to the works as possible, and to be fortified with earthworks. In order to facilitate communication between the two Armies, the construction of numerous bridges over the Seine and Marne was provided for."

For the investment of the South side of Paris, the Crown Prince issued the following order on 16th September:—"On the 17th the 2nd Cavalry Division will advance beyond the Seine as far as Villeneuve St. Georges, Juvisy, and Ris; on the 18th to Saclay; from that place it will reconnoitre towards Paris, and establish communication with the Army of the Meuse. The V. Corps will cross the Seine on the 18th at Villeneuve St. Georges; it will then move to Palaiseau, and occupy Versailles on the 19th, holding with its outposts the space between Croissy and the park of Meudon. The II. Bavarian Corps will reach the left bank of the Seine at Corbeil on the 17th; it will arrive at Longjumeau on the 18th, and at Chatenay on the 19th, its outposts advanced as far as the space between the Park of Meudon and L'Hay on the Bièvre. The VI. Corps will arrive at Villeneuve St. Georges on the 18th; leaving one brigade between the Marne and the Seine, it will cross the river with the remainder on the 19th, establishing its outposts, by daybreak if possible, between it and L'Hay. The Württemberg Division will take up a position near Pontault with two brigades, with its outposts on the line Ormesson, Champigny, Noissy."

The Commander-in-Chief of the Army of the Meuse issued the following orders for the investment of the North side:—

"The XII. Corps received orders to march to the neighbourhood of Claye on the 18th, to push forward its advanced troops beyond Chelles and Sévran next day, and, after bridging over the Marne to get in touch with the right wing of the Third Army. The Guards Corps was directed to arrive on the 18th at Mitry, on the 19th at Roissy, and to occupy with its advanced troops the villages of Aulnay, Le Blanc Mesnil, and Arnouville. On the right wing, the IV. Corps was to reach Dammartin on the 18th, and St. Brice on the 19th; its outposts were to hold the ground between Sarcelles and Deuil; and one brigade and two batteries were to be sent forward to Argenteuil. The Guards' Lancers Brigade attached to the Corps was ordered to watch the Seine below the latter place, and to establish communication by way of St. Germain with the 5th and 6th Cavalry Divi-

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sions, which, as already stated, were to extend along the left bank of the Seine from Poissy on the 18th."

The two Cavalry Divisions carried out their instructions without being seriously interfered with by the enemy, but not within the prescribed time. The bridges over the Oise and Seine were demolished; in order to reach the right bank of the former, a military bridge had to be constructed at Pontoise, for which purpose a Pontoon Company with the necessary materials had to be brought up. This was done on the 17th September, and so the 6th Division lost that day. The river could not be crossed till the morning of the 18th, after the Engineers had completed the bridge during the night. The 5th Division had to make a flank march of about 25 miles in order to reach the bridge, and the 13th Brigade, which acted as left flank guard, repeatedly came in contact with the enemy, who had occupied the villages between Gonesse and St. Denis. On the 18th it followed the 6th Division over the bridge. But then further delay occurred. A patrol of the 3rd Lancers succeeded in reaching the left bank of the Seine, at Triel, on the 19th, by means of an improvised ferry, and tried to get in touch with the Third Army. But before the two Divisions could cross over, another bridge had to be made; and in order to obtain the necessary stores, that at Pontoise had to be dismantled. As the passage of the 5th Division was not finished till the 19th, the night of the 19th-20th had to be taken for the construction of the bridge, and not till the latter date could the Seine be crossed.

The occupation by French Infantry of the villages in front of St. Denis, seemed to point to the intention of opposing the investing forces at this point. Since, on the 18th, the Cavalry patrols of the IV. Corps and of the Guards' Lancers Brigade were fired upon from Montmagny, Le Bourget, and Drancy, the Guards and XII Corps and the Württemberg Division (which had reached Meaux on the 17th) were ordered to hold themselves in readiness to step in, in case the necessary flank march of the IV. Corps should meet with serious difficulties. But the enemy fell back before an attack directed by the 13th Brigade against Montmagny. It was found that the villages were held by weak detachments only, which fell back everywhere before the German troops on the fortifications of St. Denis. Le Bourget, Drancy, and Bondy, however, remained in the hands of the French.

On the evening of the 19th September, the investment had been carried out on the North and East; the outposts of the IV. Corps extended from the lake of Enghien to Montmagny, and thence to Stains (4½ miles); those of the Guards from Stains, through Dugny on the left bank of the Morée, to the wood of Bondy (6¼ miles); those of the XII. Corps along the Western ridge of this wood, reach-reaching the Marne above Neuilly (6¼ miles). On the East, at Rosny, the line of investment was 3,300 yards from the fortifications; at St. Denis it was less than 1,900 yards away, but along the Morée it was as much as 7,000 yards or more distant.

The deployment of the Third Army on the South of the fortress gave rise to more serious engagements. On this side the two French

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Corps, with 60,000 men, were in readiness to oppose the three German Corps, which were not much stronger—about 59,000 Infantry and 7,322 Cavalry. (According to Heyde and Fröse, 55,464 Infantry, 5,120 Cavalry.)

On the morning of the 17th September, the V. Corps marched off for Villeneuve St. Georges, where a military bridge was to be constructed to replace the permanent one which had been blown up. The 9th Infantry Division was leading, and detached the 17th Brigade as a flank guard to Limeil. On the same morning, General Vinoy, with Exéa's Division, made a reconnaissance from Charenton towards Boissy St. Leger, in order to obtain accurate information about the reported advance of the German Armies. But he believed he would only meet their advanced troops, and that he would be able at the same time to remove or destroy the supplies stored in le Piple Château. At Créteil he drove away a party of pillaging French soldiers, and at Bonneuil he met with the Prussian Cavalry. He occupied the hill of Mesly with one brigade, holding the other in reserve at Créteil; but he was unable to hold the position against the attack of nine companies of Prussians, and withdrew his troops to Créteil. In the afternoon, after an unsuccessful attempt to recapture the hill, he fell back behind Fort Charenton.

During this fight, one battalion, 47th Regiment, and a detachment of Dragoons had crossed the river at Villeneuve in boats, and, after driving away a few Franc-tireurs, had taken up a position on the left bank at 4 p.m. When the bridge was finished the other two battalions of the regiment followed, and advanced as far as Ablon. They were followed by the 2nd Cavalry Division, which continued its advance as far as Juvisy, Athis and Villeneuve le Roi. The rest of the V. Corps remained on the right bank, the 17th Brigade undertaking the protection of the force at Limeil, with outposts from Choisy to the wood of Brevannes. According to orders, it did not cross the river till the 18th, and at noon reached Palaseau with the leading brigade (18th), the advance guard being then near Bièvre.

Following the V. Corps, the VI. Corps had, on the 17th, reached Roissy, Pontault, and Noiseau, and sent forward its outposts to Champigny, Ormesson, and Sucy. The next day, the 24th Brigade, having assembled at Limeil, put out outposts between the Seine and the Marne; the 23rd Brigade crossed the Seine, sending forward its outposts to Villeneuve le Roi; the other two brigades remained on the right bank.

The II. Bavarian Corps crossed the Seine at Corbeil on the morning of the 17th by means of a military bridge; its 3rd Infantry Division reached Villemoison, St. Michel, and Brétigny; the Cavalry reached Longjumeau, whilst the other (4th) Infantry Division remained at Corbeil. On the 18th the 3rd Infantry Division arrived at Longjumeau, the 5th Brigade being in advance at Massy and Wissous, whilst the 4th Division reached Montlhéry and Saulx les Chartreux.

Thus, at noon on the 18th September, on the space between the plateau of Villiers and the Seine, measuring barely 7½ miles, the following troops were assembled:—On the left wing, the V.

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Corps, with the right flank guard—since it was executing a flank march—in the valley of the Upper Bièvre; next came the II. Bavarian Corps in two lines, with its advanced guard, as far as Massy and Wissous; then the 23rd Infantry Brigade, with outposts at Villeneuve le Roi. It was intended that the V. Corps should continue its flank march to Versailles, that the II. Bavarian Corps should take the place of the V. Corps in the line, and that the VI. Corps should occupy the interval to the Seine.

But at this point the action of the French troops interfered with the arrangement. On the 17th, General Ducrot had advanced with the 14th Corps as far as Bagneux and Clamart; on the 18th he had deployed Caussade's Division between Trivaux Farm and Clamart, on the Southern edge of the wood of Meudon, and posted Hugues' Division near the redoubt of Châtillon, and Maussion's Division near Bagneux. On the right flank the *regiment de marche* of Zouaves held Meudon with advanced detachments at Grange Dame Rose and Trivaux Farm; on the left flank, Maud'huy's Division of the 13th Corps had been brought up from Vincennes to Villejuif. In front, Plessis Piquet, as well as the mill of the same name situated to the South, had been occupied and prepared for defence by the 15th *Regiment de marche* and half a battalion of Chasseurs. In this position the 13th Corps commanded the important high-road which crosses the low ground between the Seine and the Bièvre, ascends the Eastern slopes of the plateau by way of Chatenay, reaches its edge at Malabry, some 400 feet above the valley of the Bièvre, and then runs straight through Petit Bicêtre and Villacoublay to Versailles. It would still have been possible for the V. Corps to carry out its flank march by means of the roads running from Palaiseau to Bièvre, and from Palaiseau through Saclay and Jouy. But the former joins the high road at l'Hôtel Dieu, the latter at Petit Colbert, and neither can well be utilised until the high road has been secured, since it is only 2,800 yards distant from Bièvre, from which place it can be reached directly by a side valley.

The advanced troops of the German Corps could not help coming into contact with the French position on the 18th September. The 2nd Cavalry Division advanced to Saclay, and put out its outposts from Villeras, between Orsigny and Jouy. It sent out flank patrols to the plateau of Plessis Piquet, which met with the enemy's Infantry at Sceaux, and with his Cavalry at Petit Bicêtre and Antony. These French troops were the points of Bernis' Cavalry Brigade, which was sent out to reconnoitre, but met a piquet of the 47th Regiment at Abbaye aux Bois, in the above-mentioned side valley, and therefore retired. This regiment, which formed the advance guard of the 18th Brigade, now proceeded to reconnoitre further ahead, met and repulsed French Infantry at Petit Bicêtre and in the Bois de la Garenne, followed it up to Grange Dame Rose and Trivaux Farm, and seized these two farms. But on the advance of a strong column, supported by Artillery from the Wood of Meudon, they evacuated both places, and contented themselves with the occupation and preparation for defence of Petit Bicêtre and an outpost position extending beyond Villacoublay. The main guard was in the valley, the

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brigade at Biève and Igny, whilst the 17th Brigade had come up on the right to Massy and Verrières, where its outposts and the advanced troops of the enemy were sniping each other all night long. The Bavarian outposts had advanced, as far as Croix de Bernis and la Belle Epine, on the high road, and their patrols met with the enemy at Fontenay aux Roses, Bourg la Reine, and North of L'Hay. The outposts of the 23rd Brigade also discovered that the enemy had troops at Thiais and Choisy le Roi. Thus contact with the French position was gained all along the line. It was to be expected that serious fighting would take place on the following day.

For the 19th September the Commander of the V. Corps had ordered the 10th Division to march off from Palaiseau for Versailles, by way of Jouy, at 6 a.m.; the 9th Division, an hour later, for the same destination, through Bièvre and l'Hôtel Dieu. The 47th Regiment, half squadron 4th Dragoons, and the light battery, which had hitherto formed the advance guard of the latter division, were to accompany this advance on the right flank. But these dispositions could not be carried out.

General Ducrot had decided upon an attack on the flank of the German columns, and had ordered Caussade's Division to advance from the forest of Meudon towards Villacoublay, Hugues' Division through Pavé Blanc towards Petit Bicêtre, and the Cavalry and Artillery Reserves between the two Divisions. The right flank was to be secured by the Zouave Regiment, at Grange Dame Rose; the redoubt of Châtillon was armed with eight 12 c.m. guns, and held by the 26th *Regiment de marche* belonging to Maussion's Division; four more heavy guns were brought up into a covered position on the spur near the telegraph.

At 6.45 a.m., when the 10th Division was already on the move and the 9th was about to march off, the French attack struck the advanced troops of the 18th Brigade, and drove them back after heavy fighting. The Commander of the 9th Division sent forward one battery in support, but, in view of the threefold superiority of the French Artillery, it could do no more than relieve the battery of the advance guard, which was almost shot to pieces. During this combat the 9th Division marched off, in order to clear the way for the advance of the Bavarian Corps. In spite of this, they could not avoid crossing each other in Igny, which was passed by parts of the 17th Brigade at 7 a.m., whilst the 3rd Bavarian Division, attracted by the sound of the guns, was pressing forward at this point. The 9th Division did not halt until it reached Mont Clain, whence in consequence of the critical position of its advance guard, it sent forward the remaining regiment of the 18th Brigade (the 7th), the 5th Jäger Battalion, two heavy[1] field batteries, and two squadrons of Dragoons. It was then about 8.30.

Meanwhile the Bavarians had come into action. Their 6th Brigade—then consisting of five battalions—advanced through Bièvre on Petit Bicêtre, the remainder of the 3rd Division passing through Pont d'Antony towards Sceaux; their 4th Division and the Lancer

[1] These were not what are now known as "heavy batteries" (i.e., 4·7", &c.); the Prussians then had two natures of field guns, besides horse batteries *M.H.C.B.*

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Brigade were to remain in reserve at Pont d'Antony and Fresnes les Rungis. The fresh troops, together with the Prussian detachments, succeeded in recapturing the lost posts, and in bringing two more batteries into action.

At 8.30 (before the reinforcements of the 18th Brigade had come up), General Ducrot made a second attack on the wood of Verrières, which was held by the Bavarians. It failed, owing to the heavy rifle fire. And the Zouaves at Trivaux Farm were thrown into the greatest confusion by a few shells falling among them, and were the first to seek safety in flight towards the gates of Paris.

This was the end of the first part of these actions, for General Ducrot led his troops back to their former positions. Plessis Piquet continued to be held by the 15th *Regiment de marche*, as well as Pavé Blanc and Trivaux Farm; whilst the bulk of the two Divisions retreated in disorder to Clamart and Fontenay aux Roses. Both these farms were soon captured, and at 10 a.m. the Germans changed front, and attacked Plessis Piquet from the West and South-West. The Bavarians formed the right wing, the Prussians the left, where 9 batteries now came into action. The 17th Infantry Brigade had been brought up from Mont Clain, and was posted in reserve at Villacoublay. By order of the General Commanding, the 10th Division had turned about, and arrived at Villacoublay, which place the Corps Artillery had reached at 9 a.m., when it reinforced the German guns already in action. These were engaged with the 12 heavy guns, and numerous field guns, in and near the redoubt of Châtillon, after the last of the French troops had disappeared from the open plateau.

The Bavarians now seemed to need no further assistance, so General v. Kirchbach continued his march to Versailles at about noon, but at the request of the Commander of the Bavarian Brigade, he left temporarily at Villacoublay the 18th Brigade, with two squadrons and two batteries.

The next task was to turn the French out of Plessis Piquet, and the woods and parks connected with it, situated on the Eastern edge of the plateau. The attack could not be made from the West across the open plateau, dominated by the powerful Artillery position at the redoubt of Châtillon; it had to take place from the South-West, from out of the Wood of Verrières, since the object of the attack would itself mask the guns. The 6th Brigade requested and received assistance from General v. Hartmann, who had been continuing his advance beyond Sceaux with the 5th and 7th Brigades since 9 a.m. For this purpose he concentrated the latter at Bourg la Reine, sending the 5th to assist the 6th. After a vigorous fire action, lasting half an hour, the two Bavarian brigades dashed out of the wood and took possession of the whole position of Plessis Piquet.

Caussade's Division had already retired from Clamart to Paris during the Artillery combat which preceded the attack of the Bavarians. Similarly, Hugues' Division had retired to Fort Montrouge, and the Commander only succeeded in rallying one regiment, with which he occupied Fontenay aux Roses. But Maussion's Division, which, together with the redoubt of Bruyères, had maintained a heavy

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fire upon the advancing Bavarians, also abandoned the commanding position of Bagneux, in consequence, it was said, of mistaken orders. So the isolated garrisons of the redoubt of Châtillon and the village of Fontenay aux Roses alone maintained their positions. But even these General Ducrot considered so exposed that he gradually withdrew the troops under cover of the fire of the guns. When this died away at 3 p.m., several Bavarian companies advanced on the redoubt, and found that the enemy had abandoned it, leaving eight heavy guns behind. With the assistance of the Engineers, two companies of Jäger prepared the redoubt for defence, whilst one company was sent forward to Châtillon. The plateau of Plessis Piquet was in undisputed possession of the attacker, and the rôle of the improvised position seemed to be played out, for the defenders abandoned their hold on the left wing also.

Maud'huy's Division, after leaving the camp of the 13th Corps at Vincennes, had on the 18th taken up this part of the position, occupied the unfinished works extending from Hautes Bruyères to Moulin Saquet, and opened up communication with Maussion's Division. At 4 a.m. on the 19th September, the 23rd Brigade, reinforced by the 6th Battalion of Jäger, two squadrons and two batteries having crossed the Seine at Villeneuve St. Georges on the 18th, advanced on Chevilly and Choisy le Roi, whereupon the French outposts retired. Reconnaissance of the French position led to slight skirmishes at Vitry and Moulin Saquet. The brigade confined itself to the position it had taken up, extending from L'Hay to Chevilly, Thiais, and Choisy le Roi; and when, at 3.30 p.m., the enemy advanced from his own position with strong lines of skirmishers, supported by bodies of troops in close formation, it merely repulsed him by means of the fire of two batteries and a counter attack of the 22nd Regiment, without doing anything more.

General Vinoy states that at 8 p.m. General Maud'huy observed that Maussion's Division had abandoned its position; fearing that the enemy might get round his right flank and attack him from the valley of the Bièvre, he reported the matter to the Governor by telegram, and was immediately ordered to withdraw into the city. Now there remained in this important position but one battalion of Gardes Mobiles—the former weak emergency garrison—and even this was withdrawn during the night. The German troops did not notice the evacuation of the position until the next day, but they neither took possession of it, nor did they do anything towards rendering it useless to the enemy; they only began to attempt a few demolitions, when the French set to work to retake the works on the night of the 22-23rd September.

The hasty retreat of the 14th Corps caused the loss of the whole of the improvised position on the South front; but all the subsequent acts of the Governor were characterised by the same lack of courage. When the panic-stricken battalions poured in disorder through the narrow gates of the enceinte, the enemy was thought to be in hot pursuit on their very heels; panic seized the whole city, and the Governor thought the fortress would be in great danger if the enemy should relentlessly utilise his victory by breaking through the line

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of forts and advancing directly on the city. He had no more reliable troops, except the 13th Corps, and ordered one of the two available divisions into the city, to man the ramparts between the Bièvre and the Lower Seine (7th and 8th Sections of Defence), which naturally caused much ill-feeling among the Garde Nationale.

But the most serious consequences of all resulted from the steps he took in connection with the immediate foreground. All the advanced positions except the forts were evacuated—that is to say, the position on the peninsula of Gennevilliers, as well as the redoubts Montretout and Brimborion; and nearly all the nearest bridges over the Seine and Marne were blown up. The bridges at Sèvres, St. Cloud, Asnières, Clichy, and St. Ouen were all demolished, and as those over the outer arm of the Seine had already been sacrificed, the defenders could only reach the peninsula by the road-bridges at Neuilly and St. Denis, and by the railway bridge at Asnières, whilst the besiegers had only the railway bridges at Chatou and Le Pecq, both of which had probably only been left standing by mistake. On the South-East, only the Seine and Marne bridges in rear of Fort Charenton remained intact; all the others had been destroyed.

The result of the 19th September was therefore the decision of the Governor, as expressed by acts involving the most serious consequences, to confine himself to a strictly passive defence, and to remain within the permanent fortifications. On the other hand, the investment of the fortress had been so far completed as had been intended by the heads of the Army—that is to say, with the exception of the arc of the Seine, which was only to be watched by one brigade. A continuous position had been taken up, situated, generally speaking, on the ground which had come into the possession of the troops during their advance and the subsequent action. A closer approach would have been quite possible on some of the fronts; but it had not been intended, and the unexpectedly favourable development of the situation did not lead the subordinate commanders to undertake it on their own initiative.

DISCUSSION.

After the battle of Sedan, the leaders of the German Armies at once directed their attention towards the next important objective of the war, which was Paris, and strove to gain this object as soon as possible. This procedure was entirely in harmony with the spirit of rapid decision and energetic offensive, carried out by taking full advantage of every favourable circumstance and of the utmost powers of endurance of the troops, which had hitherto led the German Armies from victory to victory. In this way, movement was resumed in the direction which it had already taken after the battles around Metz.

But there was a great difference between the conditions underlying the order of the 19th August and that of the 3rd September. At that time the line of march was directed on Paris by "the new units assembling at Châlons," in order that they might be met, in case they advanced to the relief of Metz, or caught up in case they retired to protect the capital, and, in any case, in order that their

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intentions might be frustrated by defeating them in a decisive action. The objective was the Army.

Now, this same Army was surrounded in Sédan, defeated, and compelled to capitulate; it was the last Army of the Empire, and there remained but weak and broken remnants in the field which could be got together for the defence of the capital. These field troops could not possibly form the new objective; it was now the fortress of Paris.

The German Army was thus confronted with an entirely different problem, which demanded consideration even in deciding upon the very first steps to be taken for its solution. Against the Army of Châlons, the German Army could march off from Metz without hesitation; it was provided with all the means required to overcome any difficulty which that Army could put in its way; it was only a matter of rapid decision, good marching, and skilful concentration for united action. But in the monster fortress the forces opposing the Army were very different. It was not a case of one, or of a series of decisive engagements with a force in the field, but of a combat lasting weeks, perhaps months, with a garrison, whose position afforded absolute security against the most heroic attack, if not properly prepared, and whose Artillery created a zone all round the position, which could only be penetrated temporarily, but not permanently; in short, the opponent was one whom the means at the disposal of the Field Army were utterly insufficient to overcome.

This circumstance by no means escaped the observation of Moltke. He anticipated a serious attack, and considered that siege guns were necessary in order to enable it to be carried out. But not till the 8th September did he induce the King to order as many heavy guns as possible, with the necessary force of Fortress Artillery, to be despatched. Neither did he fail to perceive that the railway through Nancy, the only one available for the transport of the siege Park, was blocked by the fortress of Toul, and that unless this place capitulated very soon, a very considerable distance would have to be covered by road transport. But of the difficulties this would cause, and of the trouble and time it would take to collect the necessary teams and vehicles, he had no idea, for he thought the Governor-General at Nancy would be able to provide them in time.

It seemed the natural thing to take the necessary steps to force Toul to capitulate at an early date. That this did not require such extraordinary exertions was seen later. But it had been approached with the same contempt for its powers of resistance which characterises almost all the attacks of fortresses in the war, and of which the consequences were often unpleasant, particularly so in the case of Paris. Operations were commenced in good time, on the 16th August; but it was thought that one Infantry brigade and sixteen field guns could carry the place by assault, and the penalty was a loss of 17 officers and 182 men. Then a bombardment was tried, and on the 23rd August over 3,000 field gun shells were fired into the town. Not till the 10th September could the attempt be repeated, this time with 19 French heavy guns and insufficient ammunition; and only when this measure also proved of no avail was it decided

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to provide sufficient troops and guns, and to bring that force to bear which is indispensable for the reduction of even a small and antiquated fortress. On the morning of 23rd September, 53 French and Prussian heavy guns opened fire, and that same evening the capitulation took place.

It is quite evident that it was necessary to push on the siege of Toul and break down its resistance as quickly as possible. To do so demanded the employment of such a force as would be certain to paralyse the means of defence in the shortest possible time. Surprises and bombardments with field guns are all very well against places of which the capture is not of much consequence; but when so much depends upon the capture, as in the case of Toul, the place must be attacked with vigour and determination, in order to make certain of breaking down its resistance quickly. And the means for doing so could certainly have been obtained in August, if only that step had been decided upon a little more quickly, which had to be taken in the end, namely, to mobilise not only the regular siege park, which was required at Straszburg, but also a considerable number of heavy guns of defence. It was known that fortresses almost without number would have to be dealt with, and it should have been expected that more ample means would therefore be required. If it was not even possible to bring up in a few days the small number of guns required to subdue a little place like Toul, what were the prospects of the Siege of Paris, which needed at least ten times as many?

It will be objected that an earlier capitulation of Toul would hardly have made any difference, since Paris was invested on the 19th September, and on the 23rd the railway was opened by the capitulation, but could even then not be made use of for its whole length, as the demolition of the tunnel of Nanteuil sur Marne blocked it until the 23rd November. In reply, we must point out that this railway was of very great importance, that not much less than the decision of the whole war depended upon its being opened, and that consequently full and sufficient measures should have been adopted towards the removal of every obstacle to its employment as soon as it became possible to do so, both as regards the siege of Toul and the deviation round the tunnel of Nanteuil. At neither point was this done. The time required to overcome these two obstacles could not be foretold with certainty; the necessary operations should therefore have been started all the more energetically, and the more complete should have been the means supplied for carrying them out. As long as the Field Army is able to carry on a rapid advance in search of the hostile forces, and strives to defeat them when found, these obstacles on the railways, though not unimportant, are of less consequence. But the moment that a fortress, particularly so large and strong a fortress as Paris, becomes its object of attack, the moment it is obliged to consider the problem of concentrating its strength on a fixed point, and of confining the war to a definite limited area, then the railways become its very arteries, which are indispensable, not only for its maintenance, but also for the purpose of increasing its strength by means of more powerful means of offence. Now, there were altogether only two railways that could be employed;

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and as one of them was blocked by Metz, Thionville, Mézières, and Soissons, and would probably remain blocked for a considerable time owing to the large force shut up in Metz, every means should have been adopted to open up the other one as soon as possible. The proper course, therefore, was not to attack Toul by unprepared assaults or by shooting at it with field guns, but to employ the most powerful means against it. The place could then have been reduced at least two weeks earlier. This certainly would not have opened up the railway to Paris, but that to Soissons, and the latter fortress could then have been taken, by which means the line Châlons, Soissons, Paris would have been opened. Even granted that there would still have been the obstacle outside Nanteuil, on the line through Epernay, it was surely a matter of extreme importance to have secured fully four-fifths of the whole length. To bring up the necessaries for the troops, and the means of attack from Toul—a distance of 155 miles as the crow flies—was soon found to be absolutely impossible. To do so from Nanteuil was possible, as was subsequently discovered, and it would have been so to a larger extent if the Field Soldier could only have made up his mind to duly consider the conditions of siege work, to estimate the siege appliances at their proper value, and to act with corresponding energy and forethought.

And now for the tunnel of Nanteuil. Was it really impossible to remove this obstacle before 23rd November? The Third Army had passed Nanteuil on 13th September; on the 19th October, five weeks later, the construction of a loop line was begun, and was completed in another five weeks. We need not seek to discover why the first five weeks were not employed for the purpose. Had the firm conviction of the necessity of overcoming this obstacle existed, the fixed determination to find ways and means of doing so would not have been wanting.

At any rate, had Toul capitulated a fortnight sooner, and had the necessary arrangements been made to enable an Artillery Park to follow immediately in rear of the Army, then this Park could have been at Nanteuil on the 19th September, the day on which the investment was actually carried out. And might not the latter perhaps have been somewhat delayed without disadvantage? But that question we will deal with later.

First, we will consider the steps taken to remove the obstacles which prevented the employment of the second line, Saarlouis, Metz, Reims, Paris. Besides the large fortress of Metz, no less than five fortresses commanded it in 1870, of which only Sedan had fallen; there remained Thionville, Montmédy, Mézières, and Soissons, small places which the Field Army could pass without danger; but their garrisons could make themselves extremely unpleasant on the lines of communication, as was repeatedly found during the campaign, and their somewhat extensive operations had therefore to be held in check by troops detailed to observe or invest them. But their chief importance undoubtedly lay in their power to block the railway; and as this railway formed part of so important a line of communication, any General was bound to consider the question of their capture as soon as this line became necessary for the execution of his plans.

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And now let us investigate the nature of the measures which were actually adopted for their capture.

Thionville was only 16 miles from Metz, and had therefore to be taken into consideration during the siege of the latter place; being in rear of the investing Army, it might easily have proved very inconvenient, and its capture was therefore necessary, quite apart from the advantage it might have afforded Bazaine, if he had displayed greater energy in his attempts at breaking away. On the 15th August, one brigade of the VIII. Corps had intended to take the fortress by a "coup de main," but had given up that idea in view of the obstacles with which it was surrounded. During the whole of the investment of Metz, observation, and a very superficial one at that, was all that was deemed necessary, and the security of the investing troops against the garrison of Thionville was the only point considered, there being neither strength nor interest enough to devote to the removal of the serious obstacle on the railway. On the 6th September, it is true, it was suggested to the Commandant that he might capitulate; but this only resulted in greater activity on the part of the garrison against the weak observing force. On the night of the 24th-25th September, it succeeded in bringing a train full of provisions into the fortress by the Luxemburg railway, in spite of the hasty demolition of the latter. Then the Commander-in-Chief of the Army outside Metz thought it was time to act with greater energy, and ordered General Biehler, of the Engineers, to make proposals. But as the latter considered an attack without heavy guns to be hopeless, and those at Metz, though they were never engaged, were thought to be indispensable, the siege of Thionville was postponed till after the fall of Metz.

This event at last took place on 27th October, and now the 4th Infantry Division could be detailed to attack the neighbouring fortress, with the help of the 60 heavy guns employed outside Metz; but it was thought more necessary to capture Verdun first, although it only blocked a branch line, which at the time could very easily be dispensed with, and not until this place was taken on 8th November did the turn of Thionville come. The fortress was invested, and all the necessary preparations for the attack were made; the batteries opened fire on the 22nd November, and the place surrendered on the 24th. It should have been possible to take it with but little loss, at the same time as Metz, which capitulated a whole month earlier.

It almost seemed as if the task of capturing the fortresses on the railway of the Ardennes, one after another, had been specially reserved for the 14th Division. Montmédy, which was the next one to be attacked, had, on the 5th September, been treated to a bombardment by ten field batteries of the 2nd Guards Infantry Division; but since then it had been left in peace, until it attracted attention by capturing the Station Commandant on the line of communication at Stenay, and also two Landwehr companies, on the 11th October. Now a few battalions were spared in order to observe the fortress, although this force was insufficient for an investment owing to the difficult nature of the ground. At the same time, 5½ battalions, 4 squadrons, and 1 battery were tied down by this difficult and thank-

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less task, until the fall of Thionville enabled the 14th Division to wander on and take Montmédy. Forty-four heavy guns were brought into action on 12th December, and the capitulation took place on the 14th.

On the 18th December the advanced troops of the 14th Division reached Mézières, the next objective. With this fortress an armistice had been agreed upon, which had been observed until the beginning of October, since, after the battle of Sedan, the Commandant had allowed supplies for the French Armv to come through from Belgium. After this it was ordered to be invested; but no energetic steps were ever taken, as the detachments were continually being relieved by others, none of which were strong enough to arrange for a complete investment. Consequently, the 14th Division found that practically everything still remained to be done. By 21st December the investment was completely effected; fire was opened on the 31st with 98 guns, and the place capitulated on the 1st January of the New Year.

Now at last the important railway was opened. The Division had only taken seven weeks to capture three fortresses; but four whole months had passed since the day of Sedan, which should have been closely followed by operations against them.

The fourth fortress, Soissons, had fallen earlier. It was not unnecessary to remove this obstacle as quickly as possible; for Reims could also be reached by rail from Châlons, and after the capture of Soissons, two lines could be used between Châlons and Paris, and two unloading stations could be established. On 14th September, the IV. Corps had sent the Commandant a demand for surrender, which he had, of course, not complied with. A week later, on 23rd September, the Governor-General at Reims was ordered to invest the place; but the force of 3 weak Landwehr battalions, 1 squadron, and 1 battery, which was all that could be spared, was naturally insufficient. Not until October could the besieging force be increased to 8 battalions, 4 squadrons, and 2 batteries, but it was further immediately provided with the siege guns which were then no longer required at Toul. Although they had to be brought from Reims by road, it was possible to open fire with 32 guns on the 12th October, and to bring about the capitulation by the 16th.

In looking back upon this series of sieges, one is struck by the remarkably short space of time in which the defence of all these small, antiquated fortresses, from Toul to Soissons, broke down before a sufficiently powerful force of Artillery. That they were able to hold out as long as they did was entirely due to the feeble measures adopted against them. It is once more necessary to point out that they all of them acted as barriers to two railways, which the strategical situation and intentions rendered extremely important, and that it was therefore necessary not only to capture them at all costs, but also to capture them as quickly as possible. If, as a reason for the inadequate steps taken for this purpose, it is stated that the requisite means to carry out what was recognised as a necessity were not available, then the preparations made in time of peace were insufficient, and the needs of fortress warfare were not given due consideration. In the case of barrier fortresses of this description, one

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has to deal with factors of a definite known value, and as soon as one decides to take the offensive, and carry the war into the enemy's country, one is bound to provide the means of overcoming their resistance, in the same way that one provides for the needs of the Field Army. Otherwise, the latter itself will, during the further progress of operations, be the greatest sufferer.

It would perhaps have taken some time to bring up the means of attack; for, even if they were ready, they were still some distance away from the theatre of war. The operations of the Field Army would thereby have been somewhat delayed. But would this have caused any disadvantage? Again I must point out that the new objective of the Army no longer consisted of mobile hostile forces, but of a fortress and its garrison. The most important point was, to omit nothing which might be necessary or useful to the attack of the fortress; whether the commencement of this attack was delayed a few days was of less consequence, if by delay its subsequent progress was accelerated. There was thus nothing at all to prevent the Germans from advancing with the forces available, and seizing those railways which would be required during the siege; it was only by so doing that they would be in a position to remove the demolitions and obstacles which prevented their use. But since no hostile forces worth mentioning could possibly be met with during this advance, it would have done no harm if various bodies of troops had been detached for the investment and attack of these small fortresses. After that, only the Artillery would have been needed to bring about their speedy capture.

Then, again, by delaying the investment of Paris, the besieging Army would have been considerably reinforced. The Corps which advanced on Paris directly after Sedan, had been considerably weakened by the previous sanguinary battles. The removal of the captured French Army withdrew no less than a quarter of that of the Germans. Whilst the rapid advance of the Third Army and of the Army of the Meuse prevented their drafts from catching them up, the Corps which stayed behind were able to complete their sadly reduced numbers. Probably one week would have sufficed to bring up the drafts to the advancing Corps, as well as to enable those left behind to rejoin the Army—they actually did arrive before Paris on the 22nd and 23rd September. Then very much stronger forces would have been available for carrying out the investment, and for commencing a determined and systematic attack from the first day. The Germans would have had at their disposal eight Army Corps, one strong Infantry Division, and four Cavalry Divisions, which, allowing for the partial arrival of the drafts and for units detached on other duties, would not have numbered much less than 200,000 men.

The question is, whether the enemy would have derived any appreciable advantage from this delay. As far as the permanent works were concerned, there were only a few deficiencies in the enceinte to make good. The forts were already completed and ready for action by the 19th. The provisional fortifications on the West and South would not have been defensible a week later; they had

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been planned on too elaborate a scale, and had not been pushed on with sufficient energy; a few of them had not even been begun on the 19th September. The supply of food had been so abundantly provided for, that it enabled the defence to be carried on for a far longer period than anyone had anticipated. The organisation of the garrison would have made hardly any perceptible progress. A week later, the backbone of the defence would still have been the two organised Army Corps; and even if a large number of battalions of the Garde Mobile had been led into action also, the reinforcement of the besieging Army by trained and proved troops would still have been worth more than the increase of the defenders by means of these units of armed civilians.

Whatever advantage the organisation of defence in the provinces might have derived from the delay in commencing the investment is hardly to be considered; for the formation of new armies for the relief of the capital went on undisturbed just the same, whether Paris was invested or not. But how long Paris could hold out mattered a very great deal to them; and if this delay would confer upon the Germans the advantage of being able to take active steps from the very beginning of the siege, by providing the necessary troops, as well as allowing the required material, in particular heavy guns, to be held in readiness at Nanteuil or brought up in a very short time through Soissons (supposing Toul to have already capitulated), then we may safely assume that the resistance of the fortress would have been broken far sooner, that not hunger, but the superior strength of the Germans would have brought about the capitulation; and in that case the Armies organised in the provinces would never have become as dangerous as they afterwards did.

But even had the circumstances been less favourable, had it been necessary to take any disadvantages into the bargain, it was still necessary to delay the commencement of the siege until all the means required to carry it through with success had been sufficiently provided for; the most important of these means are troops, railways, heavy guns, and Artillery and Engineer stores of every description. For upon the rapid conclusion of this siege depended the decision of the whole war, and only after all these necessaries had been provided could it be continued in a manner to ensure success, and brought to a satisfactory conclusion.

By putting off the investment for a short period, sufficient troops and time would have been gained to avoid all flank marches in carrying it out; three Armies could have operated on the North, South-West, and East of the fortress in such a manner that only a concentric advance was needed in order to seize any opposing troops of the garrison in front and drive them back, thus closing round the place with a firm grip.

There is no doubt that a Northern Army could, by way of Nanteuil le Haudouin and Senlis, have reached Beaumont without interference, and that a Southern Army could similarly have reached Chevreuse by way of Melun and La Ferté-Aleps, whilst an Eastern Army advanced slowly along the Marne and arranged everywhere for sufficient communication by the construction of bridges.

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Had the Governor of Paris been able to grasp the needs of the moment, and to handle the mobile forces at his disposal in a manner more calculated to meet them, then the passage of the river at Villeneuve St. Georges on the 17th September would have been fraught with considerable danger. The heights of Lameil certainly did afford a good position for defence during the construction of the bridge and the passage of the river; but in the space between the Seine and the Marne, the defender possessed a splendid place of assembly, less than nine miles distant, from which he could advance to attack Limeil, and owing to the proximity of the bridge, seriously interfere with the passage.

By combining an advance of this kind on the right bank of the Seine with an attack upon the left also, it would have been quite possible to render the passage very difficult. It is possible that it was owing to the risk involved, in this passage on the 17th, that only one division took part in it, of which one brigade guarded the bridge on the right bank, and the other on the left, until the 18th, whilst the Bavarian Corps crossed the Seine on the 17th at Corbeil, eight miles further South.

The peculiar situations which were encountered on the 19th September enable us to form some idea of the difficulties and dangers involved in making a flank march in such close proximity to the enemy. The deployment from column of route, which necessitated a halt on the part of the Bavarian Corps until the V. Corps had cleared its front, and also forced the latter to make a flank march almost under the muzzle of the French guns, might easily have resulted in disastrous confusion if the French troops had made a determined attack; and it took all the tactical skill and experience of the German troops to reap victory instead of defeat from the situation in which they found themselves on the morning of the 19th September. A flank march of the V. Corps in rear of and protected by the Bavarian Corps, which would have previously advanced to its intended position, would have taken more time and been less original, but at the same time, it would also have been safer.

As was often the case during the defence, the operations of the garrison were devoid of any plan or definite object. One cannot understand why the Cavalry did not remain out after getting in touch with the German columns, and why it withdrew inside the fortress, instead of watching the movements of the enemy and obtaining reliable information upon which the Governor could base his decisions. It is equally impossible to discover any reason for the destruction of all passages over the river, from the nearest to those which could only be reached in several days. The Governor must have known that this step could not delay the movements of the enemy for a single day if he was allowed to replace them by temporary bridges. If any advantage was to be gained by it, the sites of the bridges should have been defended. But for this purpose the small detachments of Gardes Mobiles which were met with on the Seine were not sufficient. Since a railway was immediately available for the defence, it was an easy matter to delay the construction of bridges at a considerable distance from the fortress. But since nothing was known

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about the enemy, the necessary orders could not be issued in time. From this point of view, even General Vinoy's attack on the 17th seems quite useless; it was merely an isolated reconnaissance, undertaken with no definite object, and productive of no result. The only step that served any useful purpose was the demolition of the bridges over the Seine between St. Denis and Croissy.

It is necessary to arrange beforehand for the establishment of an extensive, but well thought out and connected intelligence service, which should be put in motion during the days immediately preceding the investment. It should be under the direct orders of the Governor, and must employ every conceivable means of obtaining the most reliable information regarding the strength of the enemy, the composition of his various columns, as well as their lines of advance and objectives. Upon this information the Governor can, and must, base his arrangements for the employment of the Main Reserve—*i.e.*, the troops available for operations in the field.

But in order to liberate this Reserve, it is necessary above all things to provide each part of the ring of forts with a garrison able, with the assistance of the fortifications and their guns, to withstand any attempt at breaking through on the part of the enemy. Any attempt to combine the duties of the Main Reserve with those of the garrison of a Section, or to reduce the latter at those points where the Reserve is brought into action, is senseless, for it ties down those troops whose value depends upon their freedom of movement.

One cannot but suppose that Trochu considered those fronts in advance of which he posted the two Corps of the Main Reserve, as especially important, and wished to render them particularly secure by means of these comparatively efficient troops of the Line. With this object in view, he sent the 13th Corps, on the 11th September, to the peninsula of Gennevilliers, and on the 15th, ordered it to the Eastern part of the South Front; and similarly he detailed the 14th Corps to occupy the section between Bièvre and Sèvres, instead of using Gardes Mobiles for the garrisons of these sections as he did for the others. During the early days of the investment, the latter were fully equal to the duties of an "emergency garrison"; their advanced troops occupied the ground sufficiently far to the front to enable them to gain early touch with the enemy, and to oblige him to advance with caution and to keep at a respectful distance from the works; in this way they were even able to induce the hostile columns to deploy considerable bodies of men, and to cause them vexatious delays; and, further, by slowly falling back before superior forces, they kept in constant touch with the enemy, and retained possession of all the ground over which a further advance would expose him to the fire of the Artillery of the defence.

One can hardly doubt that on the South Fronts, Section Garrisons of this description could have been similarly employed with equal facility, and that they would have been far more suitable than the Main Reserve. The latter was too large for so modest a task, and so its Commander was led to adopt a course which entailed evil consequences. The ground in front of the works was then entirely denuded of troops, a large portion of the troops was in confusion,

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and at the moment incapable of action, and panic had seized the inhabitants and the garrison. That the consequences were not even more serious was, according to the Parisian view, entirely owing to the fact that the German Army Headquarters were neither willing nor able to reap the fruits of their victory by turning these favourable circumstances to account. But this question we will leave till later.

The provision of adequate Emergency Garrisons for all the sections would have necessitated timely decision as to whether, on the South Front, the line of permanent forts only was to be treated as the main defensive position, and held accordingly, or whether the improvised position was to be armed and occupied with the greatest possible rapidity; and after this was arranged for, the two Army Corps would have been available for any duty required of them. Combined into one command, with the Cavalry Divisions attached, they could have been ordered to get in touch with the enemy's columns a considerable distance away from the fortress, and to obtain intelligence of the necessary accuracy; they could further have been directed to delay their advance by means suitable to their movements and strength, either by occupying a position which the enemy could not circumvent, or by making an energetic attack on the advancing columns. The former object might have been achieved by the Cavalry, supported by small Infantry posts stationed in important localities, from which they could at any time have been quickly withdrawn by rail.

Their report of the simultaneous advance of the enormous attacking forces would have immediately shown the hopelessness of the idea of sending the Main Reserve to oppose them at a distance. Since 1870 it has often been suggested that the Main Reserve should operate in this manner at a distance from the fortress; but it is obviously out of the question when the enemy advances in closed bodies, and is extremely dangerous even after his columns have separated for the purpose of surrounding the fortress, but are still within a day's march of each other. In this case, also, they will be able to take the Main Reserve of the fortress in flanks and rear, and render its retirement extremely difficult. Only under one condition, when the columns of the besieger advance singly on the fortress from different bases, is it conceivable that the mobile troops of the garrison could move out against a possibly weaker column and successfully engage it without unduly hazarding their timely retreat on the fortress. For they must never lose sight of the one consideration of all others which should govern their enterprises, which is that their sole duty is to assist in prolonging the defence, and that they must avoid any action which might unduly reduce their strength. They must remember that their opponent can usually replace his casualties, but that they themselves form an important part of the defence which it is impossible to replace.

Generally, the Reserve can only seek to fulfil the second part of their duties in the more immediate vicinity of the fortress, and at Paris the Seine afforded a welcome opportunity of impeding the advance of the Third Army, whilst the flank march of the V. Corps invited vigorous attack. But, whichever step was decided on, it should

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have been carried out by the whole of the mobile forces, united under a single Commander. Both Corps had, it is true, been put under the command of General Ducrot on the 18th September, when it was much too late; but during the attack of the 19th there was no indication whatever of unity of command. It was executed by the 14th Corps alone, and came to grief owing to the dispersion of forces indicated by this fact.

The French have not been alone in reproaching the German Army Headquarters with excessive caution in not following up the defeat of the 14th Corps. It is said that since this was accomplished early in the afternoon of the 19th, and was followed by the disorderly retreat of the garrison, an attempt should have been made to seize a part of the enceinte. In reply, it has been stated that there were no fresh troops available for this purpose, and it must be admitted that the three Prussian and two Bavarian brigades that had not been engaged would hardly have been equal to so hazardous an undertaking. The rapidity with which the investment had been pushed forward had made it impossible to await reinforcements which would have provided sufficient forces with which to seize specially favourable opportunities of gaining a success so far beyond the scope of the original scheme. In any case, a consideration of the nature of the fortifications would have prevented such an attempt on this side. Both the forts and the enceinte offered absolutely storm-proof obstacles which could not be overcome without special appliances. The intervals between the forts were only 1,550 and 2,200 yards, the enceinte was little more than 2,000 yards behind them, and any attempt to get in here in face of the powerful armament of the works would have involved extraordinary losses and very great risk. The garrisons were posted behind high revetments, and could not be expected to so far fail in their duty as to run away or abandon their guns.

Another quite feasible alternative was to cross the bend of the Seine, with a view to seizing the peninsula of Gennevilliers, but for this there were not enough troops. There would have been if the investment had been delayed for one week; but it could certainly not be effected with the one brigade which was ordered to occupy Argenteuil on the 19th.

But one may well ask why the position prepared between the Upper Seine and the Bièvre, and abandoned by the French, was not occupied, or why at least the incomplete works were not immediately demolished. This important question will have to be investigated later.

(c). The position of the investing force.

The object of the further advance on Paris, as defined in the order issued by General von Moltke on 15th September was to cut off all communication with the rest of France, and to stop any attempts at bringing in supplies or relieving the place. "Generally speaking," he says, "the troops should therefore not be exposed to Artillery fire from the works, but should at the same time be pushed

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as close up to them as possible," and then proceeds: "It is further the duty of the investing forces to strengthen their front line by means of fortifications, and to obtain accurate knowledge of the means of defence of the enemy."

In accordance with this order, the troops at once began to establish themselves in the positions they had taken on the 19th, and to entrench themselves there. It was, on the whole, left to the Army Corps and independent Divisions to select their own positions, and to decide upon the method of fortifying them. This was done in consultation with the Engineer Officers on the Staffs, to whom also the supervision of the work was entrusted. The occupied villages were first prepared for defence, emplacements for batteries were built to support them, they were then connected by lines of obstacles and Infantry positions, and thus, in a short time, a continuous position was constructed. On particularly important heights in front of or between the villages, recourse was had to more elaborate works, such as redoubts and closed Infantry posts; in many places the Artillery fire of the defence called for numerous strong shelters; the vigorous sorties of the garrison necessitated considerable extension of the obstacles; and so the work of perfecting the position continued till far into the winter.

Interesting as the technical development of this investing position undoubtedly is, I consider it out of place to go further into it here, as our chief interest is centred on the tactical questions involved. We must briefly consider the view taken by the different Corps of the task that confronted them, and in doing so we shall discover considerable differences between them, though not to the same extent as was the case at Metz.

The IV. Corps posted its Jäger battalion in Chatou and Bezons, and one Infantry battalion in Argenteuil. At this point the Seine for the time being afforded sufficient security to the weak force employed, as well as a complete bar to communication with outside, since the French had abandoned the peninsula of Gennevilliers. It was sufficient to secure all the boats, and to guard the partially demolished bridges and possible crossing points. The Jäger battalion was certainly molested by the guns of Mont Valérien, but was able to carry out the necessary work by night.

The section allotted to the Corps extended as far as the railway to Creil, and as its defensive position it selected the edge of the plateau of Montmorency; the right wing rested on the Orgemont, which was crowned with batteries, and on the redoubt on Mont Plâtre, which was in front of it; St. Gratien, Montmorency, Graulay, and Sarcelles were fortified, and further strengthened by means of gun emplacements. The outpost line ran through Ormesson, La Barre, Deuil, Les Carnaux, and Pierrefitte. The main position was thus nearly 5,000 yards, and the outpost line over 2,700 yards from the works of the fortress (except at Pierrefitte, which was nearly 1,900 yards). The outposts were to offer no resistance to an energetic attack, and even Deuil, in spite of its retired position, was not to be occupied in this case. It very soon became evident, however, that they showed very little inclination to evacuate their position.

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Pierrefitte was taken on the 21st September, after a short fight with a French picquet, in spite of heavy Artillery fire from the works of St. Denis. On the 23rd the enemy attempted to recapture the place with a stronger force, and succeeded in pushing back the two front companies of the battalion holding it; but they had to give way before the reinforcements which hurried up from Montmagny. Attacks of this kind merely led to constant efforts at increasing the strength of the outpost line.

Omitting the space of 8 miles between Croissy and the Orgemont, the position held by the Corps was about 6¼ miles in length, and was therefore occupied by about 1.8 rifles per yard. The right wing was to be allotted to the 1st Division, the left to the 7th, the boundary between them running East of Montmorency and Deuil.

The position of the Guards extended as far as the railway from Paris to Soissons, covering a front of some 7½ miles. From Sévran to Dugny it followed the course of the Morée, which had been converted into a formidable obstacle by drawing off the Ourcq Canal and inundation. At Dugny, this brook joins the Croult, which had been dammed up in front of the Fort de l'Est by the French. In this manner a continuous obstacle was formed, which completely separated the flat ground surrounded by the Croult, the Morée, and the Ourcq Canal, from the foreground of the fortress. Behind the obstacle were the supporting points of Aulnay les Bondy, Le Blanc Mesnil, and the Infantry shelters and gun emplacements constructed for the purpose of completing the position; in front of it were Dugny and a couple of small "têtes de pont" on the principal communications at Pont Iblon and Blanc Mesnil. Connection with the position of the IV. Corps was established by way of Garches, which was prepared for defence, and by means of a fortified position between this village and the railway to Creil; Bonneuil, and Arnouville, which lay further back, were also fortified.

The outpost line joined that of the IV. Corps at Stains. But in the section formed by the watercourses, only Le Bourget was held; this village was separated from Stains by the obstacle, and was situated about 1¼ miles from Dugny, and nearly 2 miles from Le Blanc Mesnil, and thus formed an absolutely unsupported advanced post. The General Commanding the Corps evidently considered it too risky to extend his outpost line by taking possession of Drancy and Groslay Farm on the far side of the Molette, although this would have taken him no nearer to Fort Aubervilliers than he already was at Le Bourget, *i.e.*, 3,100 yards.

The right wing of the defensive position was 4,400 yards from the French forts, and Dugny was 4,100 yards from them; but as it approached the Ourcq Canal this distance increased, until at Aulnay it was as much as 7,700 yards. The strength of the defenders was approximately 1.45 rifles per yard, but as the dividing line between the two Divisions was at Dugny, the Morée line was really held in far less strength, *i.e.*, by 1.1 rifles per yard (2nd Guards Infantry Division).

The XII. Corps was told off to the section between the Ourcq

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Canal and the Marne, and held the villages of Livry, Clichy, Montfermeil, and Chelles as supporting points in its position, which was thus at a mean distance of 7,700 yards from the forts. The woods in front made it necessary to place the outpost line some 2,700 yards further to the front. It followed the Western edge of the forest of Bondy, from the Paris-Nanteuil railway through Voirie and Le Village, and reached the Strassburg line at Raincy Station, cutting off the piece of forest North West of Villemomble. It then followed the railway embankment as far as Maison Blanche, running thence through Ville Evrart to the bank of the Marne. In rear of it, Gagny and the farm of Le Chenay were prepared for defence.

Owing to the enclosed and difficult nature of the ground, it seemed advisable from the very first to prepare an intermediate position nearer to the outpost line, and a commencement was made by fortifying the farms of Maison Guyot and Maison Rouge, and establishing a post at the Carrefour des six Routes. Later on this position was further strengthened, and connected on one side with Le Chenay, on the other with Voirie, by means of cuttings in the woods and defensible abattis.

The line separating the two Divisions passed South-East of Clichy. The Corps could count on 2.3 rifles per yard, and the position had a total length of 9,900 yards, or over 3½ miles.

At Gournay, on the left bank of the Marne, the line was continued by the Württemberg Division, which held the next section as far as Ormesson, a distance of about 6¼ miles. Its defensive position extended from Noisy le Grand, through Villiers, Coeuilly, and Chennevières to Ormesson, whilst the outposts were advanced to the bank of the Marne, and as far as Le Plant and Champigny sur Marne, in the peninsula of Joinville. The line could only be weakly held (1.2 rifles per yard), and there were only two companies of Engineers at hand, of which one was fully occupied in building bridges over the Marne and Seine; so the fortifications made but little progress. Possibly it was considered that the Marne, all the passages over which had been destroyed by the French, formed so good an obstacle that a hasty preparation for defence of the villages and the construction of a few gun emplacements would suffice. The distance of the forts varied between 4,400 and 6,000 yards, and no serious damage appears to have been sustained by their fire.

The gap between Ormesson and the Seine (Villeneuve St. Georges) was filled on the 23rd by the XI. Corps, which occupied the villages of Sucy en Brie, Boissy, Limeil, and Villeneuve St. Georges, what was left of the 21st Division being stationed on the East, that of the 22nd Division on the West side of the road to Melun, thus selecting the edge of the plateau, 7,000 to 8,000 yards from the forts, as a retired position.

The Corps had left Sedan with 13½ battalions and 5½ squadrons, and had been further reduced by having to detach 4 more battalions, so that the strength of its Infantry, though increased by drafts from home, cannot have been more than 9,000 men. This, on

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a front of 8,800 yards, allows slightly over 1 rifle per yard. This may have been partly the reason why the General Commanding the Corps decided from the very first to treat the position on the edge of the plateau as a second position, and to direct all his efforts towards improving the one further to the front, which had a length of only 6,600 yards, and extended from Bonneuil, over Mont Mesly, through Mesly and Carrefour Pompadour, to the houses of Choisy le Roi, on the right bank of the Seine. This line was still about 4,500 yards from the forts; cover for both Infantry and Artillery was constructed in it, and a strong retired point of support for the left wing was made at Ferme de l'Hôpital.

As was to be expected, the defenders sought to check the progress of the entrenchments, particularly of those on Mont Mesly, by Artillery fire, which led to the employment of stronger profiles, and, above all, to the provision of numerous bomb-proof shelters. It was not possible to prevent their execution, and work on an Infantry redoubt on Mont Mesly commenced in October, was temporarily stopped, not owing to the fire from the forts, but for want of labour, and was not completed till early in January, when more labour was available.

In the space between the Upper Seine and the Bièvre, the VI. Corps had at first only 3 Infantry brigades, about 16,000 rifles. But all 4 brigades were present from the 23rd onwards, and their strength amounted to 21,575 men. Whilst the 24th Brigade remained temporarily on the right bank of the Seine, the 23rd had crossed that river and sent its outposts on as far as Villeneuve le Roi on 18th September. On the morning of the 19th it had reached the position of Choisy le Roi, Thiais, Chevilly, and L'Hay, and held it against an attack of the enemy. During the day the 4th Division had encamped near Orly.

On the 20th it was ascertained that the French had, during the night, abandoned the positions of Moulin, Saquet, Villejuif, and Hautes Bruyères, but the Divisional Commander thought General von Moltke's order prevented him from seizing it, as this might have led to serious encounters and heavy losses from the fire of the enemy's Artillery. But General von Tümpling ordered the redoubt of Hautes Bruyères to be levelled as far as possible before the enemy had time to re-occupy it. Preparatory to this measure, a reconnaissance towards Villejuif was undertaken on the 22nd, because in the meantime the Commander had been informed that the guns had been withdrawn from the forts in front of him. One battalion did get as far as the Northern edge of the village, after driving away a few Gardes Mobiles; but here they were met with shell fire from Fort Bicêtre, which caused them to return. The battalion was sent up to the North edge again, to cover the work of destruction, and late in the afternoon it was threatened by an attack in superior force. Maud'huy's Division advanced from Fort Bicêtre, Blaise's Brigade firmly established itself in the redoubt of Moulin Saquet and opposite the village of Vitry, and Dumoulin's brigade threatened Villejuif from the North and West. Although the Prussian battalion (I/22)

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was reinforced by 6 companies (1½ battalions) of the same regiment, the Colonel considered it necessary to retire before such superior forces. The enemy immediately occupied Villejuif with the 10th *Regiment de marche*, but the advance of the 9th was checked by the fire of a Prussian battery and two companies of Infantry (5 and 8/22), which had gone forward on the West side of the village. They quickly extended in skirmishing order, and under their cover the Engineers began their work on the redoubt of Hautes Bruyères. But it was only possible to cut through the parapet in four places, a damage which could easily be repaired in a few hours by night.

"In the meantime, the Commander of the 12th Division had, with the consent of the Corps Commander, determined to keep possession of the ridge of Villejuif, which he still imagined to be held by his own troops. When he therefore received the report of the evacuation of the village, he ordered the battalions of the 22nd Regiment to advance against it once more that same night." (Official account.) But both this attack, and another from Thiais on the redoubt of Moulin Saquet, failed under the heavy fire of the strong French garrison. The 12th Company still held the redoubt of Hautes Bruyères, but had to abandon it to the 9th *Regiment de marche* at daybreak; it was subsequently reinforced by a second company, and attacked again, but was then met with Artillery fire.

Under cover of the Prussian batteries the companies retired; three batteries fired at Hautes Bruyères at a range of 2,000 yards (from the emplacements at Thiais), and were answered by the heavy guns in the redoubts on either side of Villejuif and in the three nearest forts, besides by a Naval and a Mitralleuse battery. "When the enemy's fire slackened at about 9 a.m., owing to the successful effect of the Prussian Artillery, the Prussian batteries and battalions returned to their former positions." (Official account.) The Jäger, who had succeeded in entering Vitry in the early morning, were also unable to hold out against the French Artillery, and abandoned the place towards 8 a.m.

From this time on, the ridge of Villejuif remained permanently in the hands of Maud'huy's Division, whilst the VI. Corps confined itself to holding the position of Choisy le Roi, Thiais, Chevilly, and L'Hay, the distance between them being nowhere more than 2,200 yards, and at L'Hay as little as 900 or 1,000. The 12th Division fortified these villages as part of the main line of defence, held them with one brigade, and established its line of outposts 200 to 500 paces further in front. The other brigade formed the second line, and occupied Orly, Grignon, Rungis, and Frènes, where it prepared a supporting position, whilst the 11th Division acted as a reserve, and went into cantonments in rear. On the 1st October the Divisions changed over, and not till the 12th October was the frontage divided between them, when the 11th took over the ground on the right of the Fontainebleau road, the 12th Division that on the left. As the frontage to be held was so short—only 6,600 yards—one division (nearly 11,000 rifles, including the Jäger battalion), seemed sufficient to hold the positon until the arrival of the Reserve Division, since there were about 1.65 rifles per yard.

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The II. Bavarian Corps established itself on the ground it had taken from the 14th French Corps on the 19th September; its defensible position extended from Bourg la Reine, through Bagneux, Châtillon, and Châtillon Redoubt, to the pond of Chalais, along the Northern edge of the plateau of Plessis Piquet. The redoubt was renamed "Bavarian Redoubt" (Bayernschanze), and formed the principal support of the left wing, held by the 3rd Division, whilst the 4th Division prepared a supporting position for itself at Fontenay aux Roses. In spite of the proximity of the forts (Bagneux is about 1,650 yards from Montrouge, Châtillon 900 to 1,000 yards from Vanves), at first even considerable detachments of men could be sent to work on the entrenchments without cover, and without suffering from the enemy's guns in any way. And this, although their position, as far as the adaptation of French works was concerned, was well known to the defenders.

The Reserves prepared a retired supporting position in the line Croix de Bernis, Sceaux, Plessis Piquet, Petit Bicêtre, Villacoublay, at a distance of about 3,800 yards from the forts. The garrison of this section was very strong, 16,316 rifles on a front of 8,200 yards, or about 2 rifles per yard.

The section told off to the V. Corps, extending from the pond of Chalais (Mirtailleuse factory) to the lower Seine, was far weaker. Its frontage was about 12,500 yards (7¼ miles), and was held by 17,600 Infantry, increased to 19,600 by the arrival of the first drafts from home. These figures give 1.4 and 1.55 rifles per yard respectively. But here also it was decided to hold the front line, running through the Castle of Meudon to Bellevue on the Seine, thence by way of the redoubt on Brimborion, re-named Fort Kronprinz, to the castle and park of St. Cloud, where it turned to the North-West, past Hospice Brezin, La Celle St. Cloud, and Bougival, to the Lower Seine. On the latter part of the line, the outposts were advanced about half a mile to Garches, La Bergerie, and La Jonchère. A retired position some 2,700 yards back, though partly commenced before, was only completely finished in November; at the same time, a work begun by the French in the wood of Meudon (South of Sèvres) was completed, under the name of Jägerschanze, to act as support for the right wing, and the position was extended South-West of Ville d'Avray and Marne towards Château de la Marche and Le Butard. The front, or defensive position proper, ran about 4,400 yards from Fort Mont Valérien, only coming within 4,000 yards of it on the North side of the park of St. Cloud. The redoubt of Montretout, about 1,100 yards further North, was considered too exposed, and only held by an advanced post.

It will serve to indicate the general distribution of troops and outposts in the line of investment to show in detail the allotment of units in the section between the Bièvre and the Lower Seine; this information is taken from the statement of Captain Pirscher, of the Engineers, who played an important part in connection with the position of the V. Corps.

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II. BAVARIAN CORPS.

Headquarters—Chatenay (end of October, 1870)

4TH INFANTRY DIVISION (Staff at Antony).

RIGHT WING.—Section Bièvre—Bourg la Reine.

7th Infantry Brigade (Staff at Croix de Bernis).

A. OUTPOSTS.

	Comp.	Baty.
Bourg la Reine: East of the Orleans road: 1 Outpost company with 4 piquets	1	...
West of Orléans road: 1 Outpost company with 4 piquets	1	...
Garrison at north part of village ... ... (1 to man outer circumference as reserve).	2	...
Support in south part of village with 1 piquet east and 1 west	4	
Special reserve at Croix de Bernis	4	1
	12	1

	Batt'ns.	Sqd'ns.	Bat'ys.
Outposts of 7th Infantry Brigade ...	3	...	1
B. MAIN BODY.			
Chatenay, Antony and Pont Autony ...	3	4	2
Total ...	6	4	3

LEFT WING.

Section Bagneux—Châtillon

8th Infantry Brigade (Staff at Sceaux).

A. OUTPOSTS.

	Comp.	Baty.
Bagneux: 4 Outpost companies at the north-east inner wall, with 8 piquets on the outer edge ...	4	...
4 reserve companies in south-west part, with 7 piquets to connect with Bourg la Reine and Châtillon.	4	...
Châtillon: 3 Outpost companies with 5 picquets at the outskirts, 2 to connect with Bagneux and the 3rd Infantry Division	3	...
Support in the middle of the village	1	...
Special reserve in Fontenay aux Roses	4	1
	16	1

	Batt'ns.	Sqd'ns.	Bat'ys.
Outposts of 8th Infantry Brigade ...	4	...	1
B. MAIN BODY in Sceaux	4	...	3
	8	...	4

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3RD INFANTRY DIVISION (Staff at Malabry).

Section—Plateau of Châtillon.

A. OUTPOSTS. 1 Infantry Brigade.

	Battalion.
Outpost company I. Quarry near Bayernschanze. with 3 piquets	
Supporting company 1 in Bayernschanze. ...	1
Outpost company II. Shelter near petroleum pond with 3 piquets	
Supporting company 2 next to above.	
Outpost company III. South-east of Clamart with 3 piquets and N C.O's. posts.	
Supporting company 3. South of above on road to Chevreuse.	1
Outpost company IV. Wood south of Clamart with 3 piquets.	
Supporting company 4 behind wood of Meudon. ...	
Outpost companies V. and VI. In wood with 4 piquets.	1
Supporting companies 5 and 6 on plateau behind wood.	

	Batt'ns.	Sqd'ns.	Bat'ys.
Outposts from Châtillon to Pond at Chalais	3	...	...
Garrison of Bayernschanze.	½	...	...
Special reserve south of road to Chevreuse	2½	2	3
Total Outpost Brigade ...	6	2	3
B. MAIN BODY. In Plessis Piquet, La Motte, Bièvre, and Igny.	5	2	2
Total ...	11	4	5

V. CORPS.

Headquarters—Versailles (10th October, 1870).

9th Infantry Division (Staff at Versailles).

A. OUTPOSTS.

Right Wing: Mitrailleuse Factory to Fort Kronprinz.

	Companies.
MEUDON: 2 Outpost companies with piquets 1 to 3, from Mitrailleuse Factory to the Castle Terraces. 1 company Jäger as reinforcement and to connect with picquet No. 4. ... ... 2 supporting companies west of Park of Meudon. ...	5
BELLEVUE: 1 Outpost company with 3 piquets. ... ... South of Bellevue. 1 company Jager as reinforcement ... 1 company as garrison of Fort Kronprinz. ... 2 supporting companies in rear of Bellevue. ..	5

	Cos.	Sqd.	Baty.
Special Reserve near the *Jägerschanze*	4	1	1
Total ...	14	1	1

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Left Wing: Fort Kronprinz to Porte Verte.

SEVRES. 1 Outpost company (detached from the Battalion on Special Reserve), re-inforced by 2 companies *Jager*.		3 Co'ys.
ST. CLOUD. 2 Outpost companies in the Castle with 4 piquets on the north and east.		8 Co'ys.
2 Supporting companies in rear of the Castle. ...		
1 Outpost company behind Porte Jaune.		
1 Supporting company south of Porte Verte. ...		
2 companies in reserve in northern part of Ville d'Avray.		
	Co'ys.	Sqd.	Baty.
Special reserve in Ville d'Avray	3	1	1
Total ...	14	1	1
	B'ns.	Sqd's,	Bat's
Total Outposts of 9th Infantry Division	7	2	2
B. Main Body in Versailles	6	2	2
Total 9th Division ...	13	4	4

10TH INFANTRY DIVISION. (Staff: Beauregard Castle).

A. OUTPOSTS.

Right wing. Porte Verte to south end of Metternich Park.

HOSPICE: 1 Outpost company in garden with 4 piquets or N.C.O's posts.		4 Co'ys.
1 Outpost company on hill to north-east with 3 piquets or N.C.O's posts.		
2 Supporting companies south of the Hospice. ...		
LA CELLE: 1 Outpost company at the Empress Kiosk, with 4 piquets or N.C.O's posts.		2 Co'ys.
1 Supporting company beside it.		
	Co'ys	Sqd	Baty.
Special reserve in Vaucresson.	6	1	1
Total ...	12	1	1

Left wing. To the Seine, north east of Bougival.

BOUGIVAL: 1 Outpost company at La Jonchère, with 3 piquets or N.C.O's posts.		4 Co'ys.
1 Outpost company on the road to Rueil, completely divided up into 2 piquets, 3 N.C.O's posts and 1 guard on the barricade.		
2 Supporting companies at the same barricade. ...		
	Co'ys	Sqd.	Baty.
At the pontoon bridge at les Tanneries	2	¼	
Special reserve in Bougival	6	3¼	1
	12	1	1
	Batt'n	Sqd.	Baty.
Total outposts	6	2	2
B. MAIN BODY. Louveciennes to Beauregand ...	6	2	4
Total ...	12	4	6

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Apart from small differences, due to local peculiarities, we find throughout that the available forces were divided into two bodies of equal strength, the outposts and the main body, which relieved each other. The former kept back a special reserve of suitable strength, and provided sufficient support for the outpost companies to enable them to man the defensive position on the piquets being attacked, and to hold it until the main body was able to come up. The piquets were only placed a few hundred yards in front of the position at those points where the distance to the enemy's lines admitted of greater depth being given to the investing position—in front of the left wing of the V. Corps, for instance—and at Bourg la Reine; everywhere else they were in the actual position, the line of sentries only being in front. Generally speaking, therefore, the outpost line and the defensive position coincided, which led to the supports being brought close up, and called for immediate support on the part of the Artillery, for which the necessary emplacements had to be provided in the position—that is to say, slightly retired, beside the *points d'appui*. All through the special Reserves were supplied with Artillery, and were posted so close to the position that the early assistance of the batteries could be counted on.

Later on, we shall have to notice how greatly the organization of the investing position on the part of the Army of the Meuse differed from that of the Third Army.

It is remarkable that, both in the V. Corps and in the II. Bavarian Corps, the Infantry was placed entirely at the disposal of the Divisions, the General Commanding the Corps keeping no troops under his own immediate command, and that consequently the Commander-in-Chief of the Army had to fall back upon the Divisional Reserves whenever an attack in greatly superior force rendered it necessary to reinforce one section by troops from another. Reserves of any size could not be detailed for the Commander-in-Chief until the investing Army received further reinforcements. At first, the Generals Commanding the Corps appear to have reserved for their own needs a few battalions of the Divisional Reserves (in the Bavarian Corps two battalions), and to have formed a General Reserve of the Corps out of them and the unallotted Cavalry and Artillery.

Early in November, the Commander-in-Chief ordered General Reserves to be formed, which were to be placed at his disposal in case of alarm, and for this purpose whole Reserve Brigades were detailed, which were held in readiness to assist the neighbouring Corps in case of necessity.

The line of investment was divided by three large rivers, and in order to provide for administrative and tactical requirements, it was imperative to arrange for sufficient and reliable means of crossing these obstacles.

In order to provide communication between the XII. Corps and the Württemberg Field Division, a pontoon bridge was thrown over the Marne at Gournay on the 19th September, and replaced by a trestle bridge in the course of the next few days. It was situated above the permanent bridge, which had been destroyed by the French, and being about 8,800 yards from Fort Nogent it seemed sufficiently

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secure from Artillery fire, until the occupation of Mont Avron by the French made its further use impossible.

But on the 21st September a second bridge had already been constructed 6,600 yards higher up, at Pomponne, by means of the light bridging equipment, which was later on converted into a permanent bridge. About the middle of November a third bridge was made between Gournay and Noisiel, after the trestle bridge at the former place had been considerably damaged by floods, and the work of replacing it by a pile bridge had been commenced.

As early as the 17th September, the Upper Seine was crossed by a pontoon bridge at Corbeil, and by another at Villeneuve St. Georges, a third being constructed at the latter place on the next day. A trestle bridge of squared timbers was immediately begun at Corbeil, which enabled the pontoon bridge to be dismantled. On the 23rd another pontoon bridge was made below Villeneuve St. Georges, and a ferry having been arranged at Choisy le Roi on the 19th, there were available by the 24th no less than four bridges and one ferry.

In consideration of the great importance for a large part of the investing Armies, and for the transport of the siege stores to the South front, of the passages over the Seine. constant endeavours were made not only to increase the number of the bridges, but also to make them of a strong and durable type. The earlier and therefore comparatively hastily constructed bridges were gradually replaced by others of a more permanent nature, and the reconstruction of the blown-up bridge at Corbeil was undertaken. It may be mentioned here that on the 2nd December the following bridges were available —the solid bridge and two trestle bridges at Corbeil, one pontoon bridge at Juvisy, one pontoon and one pile bridge at Villeneuve, besides two ferries lower down. But floating ice and floods destroyed one after the other, until on the 26th of December only the solid bridge at Corbeil remained; and the ice prevented the building of new improvised bridges until the 20th January. The most advanced bridges, of which the one West of Valenton was 6,000 yards from the French position of Villejuif, were protected by small "têtes de pont" on the banks; the approach of the gunboats was prevented by the ruins of the bridge of Choisy le Roi, which lay in the river, and when, at the end of October, the rising water diminished the security thus afforded, the obstruction was strengthened by fixing a chain barrier to the piers on the banks.

A pontoon bridge was thrown over the lower Seine at Les Tanneries on the 20th September, and protected by means of fortifications on both banks. This provided ample means of communication with the IV. Corps, posted on the right bank of the Seine. But here it was necessary to prevent the French from crossing the river from the peninsula of Gennevilliers. The two bridges at Chatou were still standing, the fuzes of the French mines having probably missed fire, as on examination they proved to be defective. At first they were closed by means of barricades, but on September 24th and 25th they were both blown up, by order of the Commander of the Corps, in order that the débris might also block up the fairway, which the destruction of the bridge of Bougival had not done sufficiently

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effectively. In this way the bridge at Les Tanneries was protected against the gunboats of Paris, whilst lower down sufficient protection was afforded by the ruins of the bridges at Sartrouville and Le Pecq. On 25th December the masses of ice coming down the river made it necessary to dismantle the bridge, and then the whole of the traffic passed over the railway bridge of St. Germain, which was still standing.

The construction, maintenance, supervision, and completion of the various means of crossing the rivers kept a considerable number of technical troops constantly employed, and the seven 1st (Pontoon) Companies, which were with the Army of investment on 9th September, were fully occupied. Ten and a half companies remained for employment on the fortifications, as the Guards and XII. Corps had each left two companies at Metz, whilst the II. Bavarian Corps had 4½. From the 22nd onwards, the numbers were increased by the two Guards' companies and three of the XI. Corps, which had been ordered to come up by forced marches, and from the 24th by the two of the XII. Corps, which brought the strength up to 24½ companies. As the length of the German position was about 54 miles, this works out at one company to about every 2¼miles of front; or, deducting those required to look after the bridges, to every 3 miles.

The telegraph troops had succeeded in keeping up with the Armies, and in a few days they had connected all the Headquarters with each other, and with the Royal Headquarters. The Third Army had 2 Prussian, 1 Württemberg, and 2 Bavarian Field Telegraph Sections. By utilizing the intact portions of the State and railway telegraph lines, they established direct communication from Lagny through Ferrières, Gretz, Villeneuve St. Georges, Lonjumeau and Palaiseau, to Versailles, and installed branch lines from Palaiseau to Châtenay, and from Lonjumeau to Corbeil, the Headquarters of the Inspector-General of Communications (General Etappeninspektion), between the 18th and 21st September. By the 24th, Versailles was connected, by means of a field line through Bougival and Le Vésinet with Argenteuil, thus providing for communication with the Army of the Meuse.

The latter had but one "Field" and one[1] "Etappen" Telegraph Section, which established communication by field telegraph between Le Vert Galant (XII. Corps), Roissy (Guards), and St. Brice (IV. Corps), and connected these places to Lagny by repairing the permanent line between the latter place and Le Vert Galant; this they did on September 20th and 21st. On the 23rd and 24th, the circle was closed by means of a field line from St. Brice through Montmorency to the Third Army at Argenteuil.

On the 5th October the removal of the Supreme Headquarters from Ferrières to Versailles necessitated the installation of a second separate line to Lagny. It would take us too far out of our way to detail the further changes that took place in the telegraphic communications.

[1] Etappen = line of communications.—*M.H.C.B.*

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DISCUSSION.

General v. Moltke's order of 15th September deals merely with the investment of the fortress of Paris. Nobody, and he least of all, can have doubted that in the case of the capital the object must be, not merely to paralyse the garrison, but to capture the place itself. He was also quite aware of the fact that this required more powerful means than he had at his disposal, and had on 8th September ordered the preparation of as many heavy guns as possible. In this order he even spoke of a "serious attack on Paris," which he never mentioned at all in that of the 15th. For the time being the sole object was the investment. This is quite typical of the views prevailing in 1870, and of the antiquated methods of Vauban, in accordance with which the task confronting the besieger was approached. I wish to take this particular opportunity of pointing out that my criticism of these views cannot possibly be directed against any particular person, least of all against our great General, since they were universally accepted at that time, and since, moreover, it was the experience gained in that very campaign of 1870 and 1871 that led to the conviction that they must be abandoned, and that a modern fortress must be approached in a manner totally different to that followed hitherto. I do not consider it to be my task to find fault, and to belittle the great deeds of that campaign, but to seek after the reasons which obliged us to change our views after 1870, and to establish the principles in accordance with which we must conduct the attack and defence of fortresses in the future.

For the time being, the sole object was the investment.

In the days of smooth-bores, when the defender was still confined to his enceinte, when, after being driven away from the foreground by the advanced troops of the besieger, he had to take refuge behind the ramparts, because he had no points of support outside, then the besieger had, for the time being, no reason to think of anything but the investment. From his position, he enjoyed an uninterrupted view of the ground which the defender had done his utmost to keep clear, and whenever the latter wished to emerge through the narrow defiles formed by the gates of the fortress in order to harass him by a sortie, he was always able to oppose him in time with superior forces, and to oblige him to retire with loss. He could advance to within a fairly short distance of the works without risking great losses through the fire of their guns; the range of the Prussian smooth-bore 12 pr. (which was not finally discarded till after 1870) was limited to 1,650 yards; that of the 24 pr. was less than 1,500, and even the heavy shell-guns and howitzers ranged no further than 3,300 to 3,900 yards, and were inaccurate even at that distance. The besieger could also assume that the defender would save his powder, and hold his fire until the attack came nearer and offered more promising targets. So the besieger could be certain that he could make all his preparations for attack without risk of interference, that he could, by means of reconnaissances, obtain information as to the dispositions of the defence, and decide upon the direction and nature of the attack, and that he could bring up his Artillery and Engineer siege trains, and

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establish the Parks, with their extensive magazines and laboratories, in accordance with his scheme. Thus he actually had, for the time being, to think of nothing but the investment. Everything else could be settled in due course, and the time spent over it could hardly be of great advantage to the fortress. The defender might clear the glacis and complete the palisades, but it was impossible to prevent that in any case; in the main, he suffered damage, for he had to subsist upon his stores, and this period of investment and of preparation of further means of attack, even if greatly prolonged, was all to the advantage of the besieger, even if it was afterwards found to be impossible or undesirable to reduce the fortress except by starvation.

It is true that the German Engineers had been the men who sought to alter circumstances in the initial stages of a siege in favour of the defence by the employment of detached, independent works, which should enable the garrison to hold the ground in front of the enceinte, and to act on the offensive against the besieger. But the results of their labours had not yet made themselves felt, and the principles of a defence based upon their employment, had not yet been tried, developed, and crystallised. These principles were indeed discussed in the text books, and those who took a professional interest in fortification had assimilated them and made them their own; but the Army at large was ignorant of them, because they had not yet been exemplified in modern war. The lessons which might have been learnt from Sebastopol were almost entirely lost to the German Army.

The theatre of operations was too remote, and all the circumstances of the war in the Crimea were too extraordinary, to attract the attention of men absorbed in problems that concerned them far more immediately; and by the time the principal sources of information about that siege had become accessible to it, the German Army was too engrossed in its own campaigns in Schleswig-Holstein and Bohemia to be generally interested in the study of the defence of Sebastopol. The study of war in the field was pursued with such zeal, that there was no time to spare for that of sieges. So it came about that the German Army entered upon the siege of the most enormous of modern fortresses with totally antiquated ideas. The French Army, however, was thoroughly capable of utilising the experience it had gained before Sebastopol, as the course of the struggle for Paris clearly showed.

These were the causes of the extraordinary phenomenon, that that Army which had produced the men most directly concerned in creating the modern fortress and the modern means of defence, was unable to appreciate them at their true value, whilst that Army whose Engineers had clung most tenaciously to Vauban's forms of fortification, without understanding his fundamental principles, was found capable of adjusting itself to the altered circumstances, and of utilizing them in the defence.

For the time being, the sole object was the investment

It is possible, indeed probable, that at Headquarters the further advance against the fortress had already been under consideration.

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We know that at Moltke's interview with the Chiefs of the Staffs of the two Armies on the 15th September, the importance of an early occupation of Le Bourget and of the peninsula of Gennevilliers had been discussed. But it can hardly be supposed that the ideas on the subject had already taken any particular direction or any definite shape, since the necessary conditions were lacking, not only on the 15th but even later. Naturally, the position and nature of the permanent defences must have been known to the General Staff, and their strategical and tactical value could be estimated from existing maps and plans. But there was as little reliable information available about new and supplementary works executed since the beginning of the war, as there was about the organization of the defence and the strength of the garrison. No doubt the latter was underestimated in this case, as it was in most others, for the order of 15th September expresses the opinion that "offensive action on the part of the garrison of Paris is improbable."

The necessary information should have been obtained by the Cavalry and by expert officers attached to it; but the three Cavalry Divisions were, on the 15th, at Tournan, Nanteuil le Haudouin, and Senlis, 14 to 20 miles from the forts, and had only just got in touch with the French Cavalry, which was seeking to avoid them. On the 17th and 18th they were prevented from approaching close to the fortress by French Infantry holding the ground in front, and continued their march to the Oise, describing a wide circle round the capital. On the South side, the 2nd Cavalry Division waited for the bridge to be built over the Seine on the 17th before crossing to the left bank, and on the 18th was still unable to gain any information about the improvised advanced position, since instead of approaching it, it marched to Saclay, keeping nearly 5 miles away from it, and sent patrols only to the North, which were checked at Sceaux and Petit Bicêtre.

It may be asked whether reliable reports as to the tactical measures and the engineering works undertaken by the defender might not have been obtained if the Cavalry Divisions had advanced earlier and with greater energy. On the South side this would probably have been possible, since there was no permanent garrison told off to this section, and General Ducrot did not push forward the 14th Corps to Clamart and Bagneux until the 17th. But from the difficulties which confronted the two Cavalry Divisions on the North-East and North, it is evident that in the future we must not expect much from the reconnaissance of a fortress by Cavalry, so long as the sectional garrisons of the defence do their duty, and establish such a screen in the foreground as will be impenetrable, at least for Cavalry. Those who think the reconnaissance of a modern fortress an easy task, do not reckon with a reliable, well-trained garrison. And this would appear to be the proper thing to do even in fortress warfare.

But since it is absolutely necessary to base the investment of the fortress upon some definite plan of attack—even if only laid down in general outline—we must conclude that the governing factors of this plan should be of a strategical, and not of a tactical, nature.

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Strategical considerations are permanent, and upon them the plan of attack can be based in advance; it is merely a question of which front is to be attacked, the means and the method by which the attack is to be carried through being left out of consideration for the time being. The decisive point is that it must be possible to convey to the ground over which it is proposed to make the attack the required nature and quantity of stores in the easiest, quickest, and most reliable manner—that is to say, that the ground must be easily accessible from the nearest available railway line.

This by no means implies that early and accurate reconnaissance of the tactical conditions is of little value or superfluous. It alone, on the contrary, affords the means of deciding upon the method of attack and the means to be employed; and early provision of the latter is not only desirable for the purpose of accelerating the siege, but also for the support of the troops who require to be relieved of the strain to which they are exposed without them.

However valuable, under certain circumstances, reconnaissances by large bodies of Cavalry may be, and however great the importance to be attached to their energetic and unforeseen advance, it should not to be forgotten that they will not attain their object in the face of an opponent who is up to his work; and then energetic action is required from the Infantry, to drive him back and obtain that information which is essential to the besieger.

The task of the besieger—at any rate, on those fronts on which the attack is to be made—is therefore not to surround the fortress outside the effective range of its guns, but to push in with energy as close to the works as possible; and the question now arises whether he should withdraw his troops after achieving his object, and let them take up a position out of range of the guns, or whether he should hold on to the ground he has seized. That the latter is, under all circumstances, desirable, is evident, for what is abandoned to-day will have to be recaptured later; and even if the assistance of the heavy guns, which will have arrived in the interval, should render the task less difficult, it will cost a good deal of valuable time and men. Whether it is possible the example of Paris can teach us, and that question we will have to consider later. On the other hand, we shall see that the abandoned ground may be useful to the enemy, and can, if he is capable of utilizing the time given him, be fortified to such an extent that its recapture is rendered considerably more difficult.

For the investment of Paris, a close approach in this sense was not intended, and although the capture of Le Bourget was specially desired, and was actually effected, it does not follow that it should be considered as a step towards carrying out an attack against the North-East fronts, since its most Southern portion is over 2,800 yards from the nearest fort. It is rather to be supposed that it seemed dangerous to leave the place in the hands of the enemy, and so give him the power of continually harassing the troops in the line of investment, which rested on Dugny and the Morée brook.

On the other hand, the occupation on the South side of a position very much closer to the line of forts, was not effected with a view to

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securing as far advanced a base as possible for the intended attack, but was due to an advance made by the defender in insufficient force, which thus gave the besieger the opportunity of seizing a section of extreme importance. There can be hardly any doubt that the V. Corps, although it had got into touch with the enemy on the 18th, would have complied with the order of the General Commanding, and continued its flank march across the French position to Versailles on the 19th, had not Ducrot advanced to the attack. For the roads by which it was ordered to march (Palaiseau—Jouy, and Bièvre—L'Hotel Dieu) did not bring it into immediate contact with the French position, and even the flank guard, advancing through Villacoublay and Velizy, would not have been compelled to interrupt its march by any fire directed on it from the position itself. It is equally unlikely that the Bavarian Corps would have been disposed to make an attack if it had come upon the position in the course of its advance. Ducrot's advance from a position not provided with a reliable garrison or a sufficient number of guns, forced the German troops to fight an action, the course of which led them straight into that position.

But they did not abandon it, but held on to it, although it was by no means beyond the effective range of the guns. And that was right. But it was also possible, and this fact is of enormous importance for those who would study the principles of modern fortress warfare.

It is surprising that the favourable opportunity was not similarly utilised by the VI. Corps, and that the position at Villejuif was not occupied as soon as it was abandoned by the enemy. Perhaps this was because it was not captured in action, and was therefore not sufficiently appreciated. Perhaps the need did not seem pressing, owing to the supposition that the enemy would not have the energy to re-occupy it. This may be the case; but the chief reason must be that action was prevented by the order, and that it was deemed imperative to avoid any measures which might lead to a serious engagement and heavy losses. The officer commanding the division thoroughly realised the great importance of the position, and believed he could hold it, but felt that he could do nothing without higher authority, and when this was obtained—three days later—it was too late.

The official account seeks to defend this error by pointing out that it did not seem possible to permanently hold the ridge of Villejuif, close in front of the forts, without the support of heavy guns, and that it would have entailed continuous heavy fighting. This argument is not sound, for the VI. Corps subsequently occupied and held a position at L'Hay which was far nearer to the redoubt of Haute Bruyères (the cemetery is 880 yards distant) than the position of Villejuif is to the forts (Hautes Bruyères to Bicêtre 1,900 yards, Moulin Saquet to Ivry 1,760 yards); both the works and the connecting lines were afterwards armed by the French with heavy guns, and were more favourably situated as against the German position—since they commanded it—than were the forts as against the ridge of Villejuif, which dominated them.

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But serious engagements and heavy losses were carefully avoided as soon as a fortress was to be attacked. In this we clearly discern the antiquated point of view based on Vauban's method of attack. The latter involved loss of time, but not loss of life—at any rate, at the commencement. The last stage, the actual assault, could not well be carried out without sacrifice, but up to that point it was considered possible, and therefore necessary, to avoid loss of life. Strassburg had in the meantime taught a different lesson, and the future will show that a siege cannot be conducted without loss of life even at long ranges, any more than a battle in the field; but the opposite belief was still adhered to at Paris.

This state of mind was intimately connected with the opinion that the capture of Paris would not require an attack involving heavy losses. The official account therefore remarks, with reference to the plan of attack:—"The question whether and when the Artillery attack or regular siege of Paris should take place, was left open. A population numbering several millions, painfully upset in all its habits by being completely cut off from the outside world, might soon demand the surrender of the city in terms that could not be denied." Here is another instance of contempt, and this time not only of the fortress and garrison, but of the inhabitants as well. Playing with imponderables is a dangerous game, and Paris teaches that in sieges we should not count, as some writers would have us do, on inferior troops, unarmed works, and weak Governors,but should from the very first prepare to meet a thoroughly competent opponent, equal in quality to ourselves. If, before the investment was effected, the Army Headquarters considered on which side of the fortress the attack should be made, the decision must have been arrived at on tactical grounds alone, not on strategical ones. The later course of the siege, and the attack from the strategically most unfavourable South front, prove that the tactical advantages were overrated, and were given absolute preponderance. A plan of attack based upon the strategical conditions could have been drawn up as early as the 15th September —and in the case of a modern fortress one would have to do so at least as early as this—to draw up a plan based upon the tactical situation was impossible, owing to lack of information concerning the dispositions of the enemy. But it was not considered necessary to do so, as it was hoped that neither bombardment nor regular siege would be needed in order to persuade the capital of France to surrender.

This was the worst error of all, for it led to the neglect of strategically important considerations, it caused the Army to arrive with a totally insufficient supply of the necessary weapons before a particularly well-equipped opponent, it prevented the necessary attention and care being bestowed upon the provision of these weapons, and led to a dilatoriness in the conduct of the siege which involved the Army in excessive hardships and losses and in serious danger.

The investment was for the time being the only problem it was thought necessary to consider, and that was the result.

That the line of investment was not entirely beyond effective range of the guns of the fortress was contrary to the intentions of

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the Army Headquarters. But it had been taken in action, and the various units held to the positions in which they found themselves; nor is it known that General v. Moltke objected to this procedure. Let us now consider how far the fortified line of investment fulfilled its object.

General v. Moltke had ordered that the investing forces were to fortify their "most advanced line," which admitted of no doubt that this foremost line was intended to be the main defensive position. But a comparison between the positions occupied by the Army of the Meuse and those of the Third Army makes it appear as if this order had not been interpreted in the same way by all concerned. The instructions issued by the Commander-in-Chief of the former repeat that: "All Corps are to fortify their most advanced line," and amplify this by the statement that in case of need, the Army is to fight in that fortified position. For this reason, the outposts should have been placed sufficiently in advance of this line, and shelter trenches should have been dug for the piquets, in order that the work could be carried out under the protection of the outposts.

But this was not the way the problem was understood at all. The Corps did not—as laid down in the order of 15th September—seek to push forward their positions as close to the fortress as possible, but tried to establish themselves in those positions which afforded the greatest advantages for defence. Since, on the North side, there was a good position on the heights of Montmorency, the IV. Corps kept nearly 5,000 yards away from the forts; since the most distant point of the easily strengthened line of the Morée brook was as much as 7,700 yards from the fortifications, the Guards withdrew their left wing to that distance, and this seems to have caused the XII. Corps to select a line at the same distance, cutting straight across the plateau of Montfermeil, although its South-West edge afforded a far more favourable position, which was still 5,000 yards away from Fort Rosny, the most advanced of the line.

In the modern view this would be called suiting one's dispositions to the features of the ground, in a case where one should make use of them to further one's own objects. As a matter of fact, the positions of the IV. and Guard Corps were determined purely in accordance with the configuration of the ground, and not at all with the object of restricting the area left in the hands of the defender to the smallest limits. The position of the XII. Corps is quite incomprehensible. This excessive retirement of the fortified lines—intended to be used as the fighting position—caused the outposts to be very far advanced, and since the latter, instinctively realising the great value of the ground, invariably stood firm with the greatest determination when attacked, more and more importance came to be attached to the defence of this outpost line. It was the most advanced line, and it was not so close to the guns of the fortress that it could not be held at all times, and so it gradually came to resemble more and more what it originally should have been, the fighting position, whilst the line of sentries was a few

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hundred yards in front of it. The original main position, which was never attacked, became a sort of supporting position.

Such was the final development of the positions of the IV. and XII. Corps—the latter even fortifying a second line between the main position and the outposts. But it was the original arrangement in the case of the Corps of the Third Army, the VI. Corps and II. Bavarian Corps being forced to adopt it by reason of the proximity of the enemy, in front of whom it was impossible to establish a weak outpost line in advance of the position which it was found necessary to hold. The exigencies of the situation resulting from the victory of the 19th September called for a remedy, and so these Corps discovered the manner in which the line of investment, pushed up as close to the enemy as possible, must be arranged. At this point, Moltke's order was strictly complied with, and the fact that it could be carried out in such proximity to the enemy, and—what is far more important—that it remained possible to do so for month after month without receiving any support from heavy Artillery, affords striking proof that the besieger should not hesitate to put forth his full strength in the first attack, in order to approach as close as possible to all fronts of the fortress, which he must in any case eventually do, and there firmly establish himself. He will be the better able to do this if the Infantry receives early support from the Artillery, which possesses in the heavy field guns and howitzers weapons which, though not enabling it to engage in a regular Artillery duel with the fortress, are still sufficiently powerful to afford the Infantry very great assistance in its difficult duty of holding on to the ground already won.

Throughout the Third Army we find supporting positions, generally two, prepared behind the fighting position; but the principal one is always the latter, and on this point the troops were never for a moment in doubt.

How correct this arrangement was is proved by the experience of the Württemberg Field Division. After its advanced troops were driven from their position on the 30th November, and the long struggle for the main line had ended on the 3rd December in the retreat of the French, the advanced line, Champigny, Le Plant, was, with the greatest energy, developed to form the fighting position, and armed with Artillery.

A peculiar position was that of the village of Le Bourget, which was held by the Guards as an isolated advanced post a couple of miles in front of their general line of defence. It might almost be described as a solitary fragment of an outpost position which should have extended through Drancy and Graulay Ferme, and, perhaps, even through Bondy to the forest of Villemomble. What reason was there for seizing this isolated post? The official account states that, in ordering the occupation of the village, the Commander-in-Chief intended "to prevent the enemy from establishing himself in the bridge-head on the North bank of the Mollette, as it would have so greatly favoured any sorties directed against the 2nd Guards' Division, or, at any rate, to force the enemy to waste time in deploy-

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ing within range of the German guns." It is evident from this statement that it was intended, not merely to observe this point by means of an advanced post and abandon it in case of attack, but to prevent the enemy from seizing it.

But if the village was thought to be so valuable to the enemy, it must surely have been anticipated that the latter would take steps to regain possession of it. A heavy bombardment with fortress guns was to be expected, and the more the place was isolated, the more concentrated and more effective would the bombardment become. There is no doubt that the fire of the French guns would have been very considerably dispersed if the whole of the outpost line indicated above had been held. But an attack by mobile troops was also to be expected, and this could only be effectively resisted if the village was supported by positions on each flank, since the nature of the ground—a couple of miles of bare plain, exposed to the fire of the forts, lay between the village and the main position—rendered the timely arrival of strong reinforcements extremely doubtful.

We may safely assume that, instead of an outpost line from Bondy to Le Bourget, a main line of defence could have been established there, and could have been held just as well as those advanced lines in the section allotted to the Third Army. Even at Bondy, the most advanced post, it would have been nearly two miles from the forts. In this case, therefore, we must lay the blame on the attraction exercised by the Morée brook, which afforded such a splendid opportunity of creating a strong frontal obstacle by inundation; and this attraction was so great that it led to the selection of a position which, though possessing distinct tactical advantages, by no means satisfied the conditions of the moment.

If the Army of the Meuse had acted on the right bank of the Seine and Marne, in accordance with the principles followed by the Third Army, and had established its main line of defence on the line Mont Plâtre (or Epinai), La Barre, Pierrefitte, Stains, Le Bourget, Drancy, Bondy, Maison Blanche, Ville Evrart, the length of its line of investment would have been reduced from 19 miles to 16, and the total length of the position—owing to the exclusion of the portion between Gournay and Noisy—by two miles more.

In fortifying the positions, the number of technical troops was at once found to be insufficient. This was natural, as the Field Army had appeared before the fortress insufficiently equipped for siege work in this as in all other respects. But even though we have the right to expect field troops to be able to carry out the necessary strengthening of their positions themselves when in the field, and though it is not too much to ask them to make their own shelter trenches and batteries, and to prepare woods and villages for defence with the means at their disposal in a siege, it is different with works that require special training for their execution. And in a siege these are so numerous that the Field Engineers are not strong enough to cope with them, and of so special a nature that the modern Engineers—being principally trained for pontoon work—are not sufficiently skilled to do so.[1]

[1] The author of course refers to the German "Pioniere."—*M.H.C.B.*

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Though we are bound to think the only course compatible with the modern idea of the attack on a fortress is to get as close to the enemy as we can regardless of losses, it is at the same time necessary to employ all available means of protection against the increased power of the defender's guns, and it cannot be denied that for this purpose technical specialist troops are required, as strong bomb-proof cover is needed, and ordinary splinter-proofs will not suffice. And as it is further necessary to be as independent of local features as possible, and to house the troops, not with regard to existing villages, but entirely in accordance with the situation of the fighting position and their employment in it, these specialists will be needed to construct shelters and other buildings for the troops on a large scale. Moreover, judging by the experience of 1870-71, in a siege even the best-made roads will be worn through by the tremendous traffic, and become useless in a few weeks, and therefore the early organization of efficient supervision and repair of all existing roads, and the construction of good parallel and cross roads in sufficient numbers is a pressing need, the neglect of which may place the Army in the most dangerous position; and for this purpose also large numbers of technical troops are required. In addition, I need only draw attention to the almost endless lines of obstacles, which can only be created with the assistance and supervision of technical troops, to the miles of portable railways which have to be laid down and managed by them for the most varied purposes, to the numerous crossings over large and small water-courses, which require the permanent attention of a large number of men in order to show that the actual siege works proper are by no means the only ones that impose heavy duties on them, and that they are needed from the very first day of the investment in far greater numbers than are usually allotted to field troops, and that reliable assistance can only be afforded by large bodies of Fortress Engineers who are competent to undertake all these duties. That their services cannot be dispensed with as the attack proceeds, we shall see later when we consider the further stages.

(d). The investment up to the end of October.

When on the 19th September the 14th Corps had, in some disorder, abandoned the ground outside the inner fortifications, when the impression produced by its failure had led to the evacuation of all the improvised positions on the South and West, and when even the Gardes Mobiles forming the garrison of the fort of Mont Valérien, feeling utterly isolated, had quitted their post and fled to Paris in complete disorder, the Parisians were entirely at a loss to discover means of opposing the next move of the German Armies, fully expecting them to appear in full strength at their gates and bombard the hapless city with heavy guns. The Governor kept his troops together, ready for the defence of the enceinte. He hastily garrisoned Mont Valérien with two Line battalions, but considered the peninsula of

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Gennevilliers to be too exposed a position for the 14th Corps, which he detailed for the defence of the right bank of the Seine, posting the 1st Division on the 20th at Clichy, the 2nd at Neuilly, the 3rd between Point du Jour and Boulogne; the 13th Corps remained for the time being where it was, Exéa's Division at Vincennes, the other two on the South fronts of the enceinte.

But the following days passed without bringing the least indication of any concerted action on the part of the Germans, and the patrols sent out by Ducrot on the 21st from the "rondpoint" at Courbevoie, where he had a sentry, all reported the peninsula of Gennevilliers to be clear of them. This evident inaction gave the French fresh courage, and they soon began, at first cautiously, but later with greater boldness and confidence, to re-occupy the ground they had abandoned, and to make use of it for the defence. And their very first attempt was favoured by fortune.

Acting on instructions received from the Governor, Vinoy ordered Maud'huy's Division to leave the city on the evening of the 22nd, and to take up a position abreast of Fort Bicêtre. He carefully reconnoitred Villejuif and the abandoned redoubts, and arrived with his battalions just in time to frustrate the belated decision of the Commander of the Prussian Division to establish himself in the whole of the position on the ridge. The well directed fire opened by the German batteries on the morning of the 23rd rendered it impossible for the time being to get guns into Hautes Bruyères; but when they ceased fire towards mid-day, the repair[1] and extension of the redoubts was carried on with the greatest energy, and arrangements were made for arming them with heavy guns; the village of Villejuif was prepared for defence, and connected with the redoubts on each side of it by means of trenches, and several batteries were constructed in the interval to the West of it. This position remained permanently in the hands of Maud'huy's Division.

Blanchard's Division had also left the city on the 23rd, and occupied the villages of Issy, Vanves, and Montrouge. In consequence of the success of Maud'huy's Division, the German outposts on the aqueduct of Arceuil had also to retire, and so this, as well as La Grange Ory, in front of Montrouge, fell into the hands of the French. Finally, a large earthwork was commenced, called the Redoute du Pont à l'Anglais.[2]

During the following days, the troops, gradually working their way to their front, engaged in minor skirmishes with the German outposts both on the East and South sides of the fortress, at Drancy, Bondy, Bagneux, Clamart, and other places, which culminated on the 30th September, on the site of their first successful enterprise, in the first sortie on anything approaching a large scale.

For the 29th, General Vinoy proposed an attack on Choisy le Roi. It is more likely that this suggestion was due to the desire to

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[1] It is difficult to understand why more effective means were not employed in the attempt to destroy the redoubt of Hautes Brugères. One would suppose that large charges could have been placed in the partially completed bombproofs, which would have done more damage in less time than digging at the parapet with spades.

[2] On the Seine, between Forts Ivry and Charenton.—*M.H.C.B.*

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refute the accusation of inactivity made against the Army by the inhabitants, than to that of destroying the bridge at Choisy, which was the ostensible reason; for there was no bridge there, and no sensible person would have supposed that the Germans had made and were using one in such proximity to the defenders' guns (4,400 yards). The Governor sanctioned this scheme, and then disapproved it, put it off to the 30th, ordered a conference of the Generals of the 13th Division to be held on the 29th, and proceeded himself on that day to Forts Bicêtre and Ivry for the purpose of issuing his instructions for the next day personally and in public, whilst General Vinoy received a scheme and instructions for the sortie worked out in minute detail.

In accordance with these instructions, at 5.30 a.m. on the 30th the forts and the heavy guns in the Villejuif position opened fire. At 6 a.m. three French columns advanced from this position in the following order:—Against Choisy le Roi and Thiais, Blaise's brigade in the first, and Daudel's brigade, with 3 battalions of Gardes Mobiles, in the second line; against Chevilly and La Belle Epine, Guilhem's brigade, the two regiments in column side by side; and against L'Hay, Dumoulin's brigade. Cousin's Cavalry brigade remained in reserve behind Villejuif.

On the German side, the 23rd Brigade (12th Division) was posted on the right, and the 24th Brigade on the left of the road (to Fontainebleau). They each had 3 battalions in the first line, the 22nd Regiment in Choisy and Thiais, the 23rd in Chevilly and L'Hay; on each wing (near Thiais and Chevilly) was one heavy battery. The 6th Jäger Battalion was at La Belle Epine. The battalions, their attention having been aroused during the night by the noise made by the field batteries on the paving of the village streets, had taken post when the Frenh guns opened fire; the two regiments of the second line were ready, and General v. Tümpling had detailed the 21st Brigade (11th Division) and part of the Corps Artillery to act as reserve.

The action did not last very long. The Prussian piquets retired to the main position, followed with remarkable dash by Guilhem's brigade, which drove the Prussian garrison of 5 companies (1¼ battalions) out of the Northern part of Chevilly. Part of the brigade advanced along the road to Fontainebleau, drove off the picquet of Jägers posted on it, and seized a factory to the South of the road to Thiais, thus enveloping the garrison, which had retired into the grounds of the château. Four guns assisted this attack by coming into action near the factory. Two companies of the 23rd (Prussian) Regiment, posted in this quarter, supported by a detachment of Jägers and the heavy battery, which came into action North of La Belle Epine, repulsed the rush of the two French battalions, and the French troops attempting to advance from the Northern part of Chevilly were also checked.

At this moment I/63 advanced in the direction of the cross-roads East of Chevilly, and two batteries reinforced the Artillery at La Belle Epine. The French suffered severely under a cross fire, and were driven back to Saussaye by the Jägers and the 63rd, but the

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fighting continued in Chevilly, as they had firmly established themselves in a large farmyard on the Northern edge of the village.

Dumoulin's brigade did not attack L'Hay with the same vigour. Its advance was checked by the strong walls of the park and cemetery, which were manned by 7 companies. Even the 4.7″ guns of Hautes Bruyères could not breach them, and when two battalions of the 63rd Regiment came up and delivered a heavy counter-stroke, the brigade was forced to retire, and was soon completely routed.

Neither did General Blaise's column score any great success. The frontal attack on Choisy was repulsed by Infantry fire. The enveloping attack on Thiais was met by the 22nd and 62nd Regiments, the latter being brought up soon enough to force the French to retire. Two batteries also came into action at this point, of which, however, 10 guns, posted on the West side of the village, had to retire to the road to Versailles when their position was enveloped; two guns on the East side remained in action, and rendered good service.

When both Dumoulin's and Blaise's troops had fallen back, and only the Northern portion of Chevilly and the plantation of La Saussaye remained in the hands of the French, II/10 was brought up from the reserve, and its attack not only cleared the plantation, but also made the French withdraw the batteries that had come into action near the Mill d'Argent Blanc. At about the same time, the last farmyard held by them in Chevilly was stormed, and over 100 men fell into the hands of the victors.

Whilst the sortie was taking place, a demonstration, for the purpose of engaging the troops in the neighbouring sections, was made by Susbielle's brigade, assisted by gunboats, against Clamart and Bellevue, and by Mattat's Infantry Brigade and Bernis' Cavalry Brigade against Mesly and Carrefour Pompadour.

In this sortie the French lost close on 2,000 men.

In consequence of this attempt on the part of the garrison, the VI. Corps returned to the work of strengthening its position with renewed vigour. Besides strengthening the front line and destroying the buildings of La Saussaye, it seemed desirable to construct a line of strong earthworks in front of the Versailles road, in order to oppose enveloping attacks on the occupied villages with better prospects of success.

Between the 8th and 10th October, in addition to gun emplacements, two redoubts (with a command of over 7 feet), and two open works for Infantry, were constructed; besides the two Engineer companies, six parties of 600 men and three of 400 were employed in four hour reliefs on the redoubts, and 300 Infantry on each of the open works.

The French devoted equal energy to the improvement of their position at Villejuif, which they continued to extend and arm with heavy guns. To begin with, Hautes Bruyères received six, and Moulin Saquet four 4.7″ guns; on October 14th three 6.3″ were sent to Hautes Bruyères, and on the 22nd, six 5.9″ went to the same work, and four to Moulin Saquet. Moreover, General Tripier drew up a scheme for attacking the German position on the left bank of the

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Seine by means of a system of counter-approaches similar to that employed by the Russians at Sevastopol. On the 7th October he began to advance on the bank of the Bièvre by seizing Cachan, and making a covered communication from Hautes Bruyères to La Grange Ory.

On the night of October 10th, with the support of Artillery fire from Fort Montrouge, the French succeeded in seizing the farm of Maison Pichon, which had hitherto been occupied by a Bavarian piquet, and in constructing a line of entrenchments which enveloped Bagneux on the East side, and was not more than half a mile distant from its North-Eastern salient, which was surrounded by a strong wall, whilst it was even nearer to the most Northern part of Bourg la Reine. Bagneux was evidently the next objective, and the next important operation seemed to be directed to its seizure.

Soon after midnight on the 12th-13th October, General Vinoy received orders from Trochu to undertake a reconnaissance in force of the plateau of Châtillon. The necessary preparations having been completed, the guns of Montrouge, Vanves, and Issy opened a heavy and destructive fire on the Bavarian lines. Soon French field batteries came into action on the East side of the road from Montrouge to Bourg la Reine, and bombarded Bagneux and Châtillon. General Vinoy advanced in three columns; on the right, two battalions of Susbielle's Brigade, with one battery and one company of Chasseurs, attacked Clamart; in the centre, Susbielle enveloped Châtillon from the West, with the 42nd Regiment in his second line; on the left, four battalions of Gardes Mobiles in the first line, and the 35th Regiment in the second, advanced on Bagneux; La Charrière's brigade was instructed to take up a position near Maison Pichon, facing Bourg la Reine, and Dumoulin's brigade was held in reserve behind Fort Montrouge. Some 25,000 men, with 80 field guns, were therefore sent against the position of the II. Bavarian Corps.

Of the latter, the 7th Brigade garrisoned Bourg la Reine, the 8th Bagneux and Châtillon, Bourg la Reine itself being held by the I. and II. battalions 9th Regiment, whilst the remainder of the 7th Brigade assembled at Croix de Bernis, and immediately despatched II/5 to the Northern edge of the park of Sceaux to establish connection with the main body of the 8th Brigade, posted at Sceaux. The 8th Brigade had posted the 5th Battalion Jägers in Bagneux, III/1 in Châtillon, and III/5 in Fontenay. The movements of the French columns had been under observation since 8 a.m., so that all preparations had been made.

Protected against Bourg la Reine by a line of skirmishers posted along the railway embankment, the four battalions of Gardes Mobiles advanced with a rush on Bagneux, surrounded the place on the South-East, and penetrated into the interior as far as the cross-roads. At 11 a.m., the 35th Regiment joined in the attack, with one battalion on the east and two on the West side of Bagneux, and forced the Jägers to abandon the village. The latter halted in a supporting position on the road to Fontenay, prepared by III/14, where they stood their ground, supported by three companies of the 10th Jäger battalion.

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Châtillon was attacked on both sides, by two battalions on each, two field guns directed an effective fire of case at short range against a barricade which blockaded the main street, and Engineers commenced to breach the houses adjoining it. The 42nd Regiment also began to participate in the attack, and the garrison found itself compelled to retire to the Southern portion of the village, where a strong retrenchment had been prepared. Fresh troops were gradually brought up to this point, with whose help the captured houses were retaken step by step, although the French Engineers assisted the attack on the Southern portion in every way by breaching walls and making covered communications. At this point, the fighting terminated in the retreat of the French, after pretty well all the available troops of the 8th Brigade had been brought into action.

On the German left, the French had found Clamart unoccupied, but had met with strong resistance on the brow of the hill, and consequently abandoned the attack.

In the meanwhile, General Vinoy had ordered up 400 Marines from Fort Montrouge to Bagneux, and commenced to pull down the strong walls surrounding the North-East side. At the same time, he skilfully and energetically set to work to prepare the South-West side for defence, for he hoped to be able to hold the place and use it as a stepping-stone towards the re-capture of the Châtillon position. But for this he thought it necessary to obtain the sanction of the Governor, and sent him the following telegram: "We have gained possession of Bagneux. I am taking steps to hold it. Do you wish to retain it?" But his proposal was not approved. General Blanchard, whose troops were engaged at Châtillon—and they would have had to hold on for a while longer—was empowered to withdraw his battalions as he thought fit, and when he did so half an hour later, at 2.30 p.m., Vinoy could only look to the forces of the left column for support.

In the meantime the Bavarians made a counter-attack. The Artillery of the main body had tried to pave the way for it, in spite of the losses inflicted by the guns of the forts, and when the Infantry advanced and enveloped the place on the South and West, Vinoy withdrew his troops, but not before his stubborn resistance had given him time to complete the destruction of the walls he had commenced to pull down.

The consequence of this action was that in the future the Bavarians occupied Bagneux with two battalions instead of one, and carried on the improvement of their fortifications with great energy. But they were unable to remove the enemy's trenches, which were so close to them, nor could they prevent the French from constructing batteries close to the road to Bourg la Reine, and arming them with 4.7″ guns. These works, completed on 22nd October, were the last of the French counter-approaches in this section. As the Governor did not wish to recapture the plateau of Châtillon, no further works on this side were needed. On the other hand, Vinoy now began to extend the position of Villejuif further on the opposite wing. By the 17th October, the redoubt at Pont à l'Anglais was nearly finished,

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and with the Governor's approval he seized Vitry,[1] drove out the Prussian outposts who occupied the Southern portion of it, and by the 1st November had got beyond the Southernmost buildings.

Trochu's attention was engaged by another project. General Ducrot had submitted a scheme of which he approved. Convinced that the German Armies did not mean to attack Paris by means of a regular siege, but were anxious to reduce it by starvation, this officer proposed that the garrison should attempt to cut its way through the line of investment. He thought that an enterprise of this nature would be successful if the garrison were assisted by a relieving Army with which it could join forces for the purpose of defeating the German Armies. To carry out this scheme, the first requirement was a large mobile Army inside Paris—and he immediately set about organizing one, for which there were plenty of men available—the second was a strong relieving Army, and for the purpose of raising it, Gambetta made his escape from the capital in a balloon on October 17th; and finally, that front of the fortress had to be selected which, from its local peculiarities and its strategical position, afforded the greatest chances of success. Tactical conditions confined the choice to three fronts, on which the German lines could be most easily pierced, the section between the Marne and the Upper Seine, the plain on the North-East, and the peninsula of Gennevilliers. But the first two were strategically unfavourable, as it would hardly be possible to escape the clutches of the Germans in either of those directions. The last seemed to offer the best chances, for if the Army succeeded in crossing the Seine, and in holding its own until it reached Pontoise, the River Oise could be used as an obstacle to cover the further retirement. In three days it would reach the Andelle, where it would unite with a relieving Army concentrated at Rouen.

But in order to carry out this plan, it was above all things necessary for the garrison to obtain absolute control of the peninsula of Gennevilliers. At the beginning of October the advanced troops of the 14th Corps held only the approaches to it between Mont Valérien and Villeneuve la Garenne. Ducrot now advanced systematically, on the 6th October to Charlebourg, and on the 9th to Petit Nanterre. A new brigade was formed on the 10th, with General Berthault in command, consisting of Zouaves, Gardes Mobiles, and one *Régiment de marche*, and stationed at Courbevoie, Puteaux, and Suresnes, which, with the assistance of a regiment of Dragoons, was to command the left bank, instead of the right, as had been done up to then.

Berthault made extensive reconnaissances, on the 12th in the direction of Malmaison, and on the 13th towards Bezons; on the 14th three more battalions of Gardes Mobiles were brought across the river to garrison Asnières, and a battery of 4.7″ guns took up a position at the "rond-point" of Courbevoie. On the 17th two more battalions became available, with which Ducrot occupied the abandoned redoubts at Colombes and Charlebourg.

The position of the V. Corps on the heights of Garches and La

[1] The original says Ivry, but this can hardly be correct—Vitry seems far more probable.—*M.H.C.B.*

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Celle St. Cloud, was a source of considerable danger to the French on the peninsula. Ducrot did not consider Mont Valérien able by itself to prevent attack from this quarter; in order to obtain a perfect view of the level ground to the North-West, and to bring effective fire to bear on the valley of the Seine from Bougival to Carrières, it was necessary to fortify the less elevated plateau from which Mont Valérien rises. For this purpose he wanted more room on his left flank, and therefore found it necessary to push back the German lines. This was the cause of the sortie against Malmaison on October 21.

Ducrot brought into action about 11,000 men and 120 guns. Berthault led the right column of 3,400 men through Rueil on Malmaison; in the centre, General Nöel, with 1,350 men, also advanced on Malmaison; on the left, Colonel Cholleton attacked the château of Buzanval with 1,600 men, whilst General Martenot took up a position facing Montretout. A reserve of 2,000 men, under General Paturel, followed Berthault's column.

On the German side, the position was no longer held in the manner originally described. After the arrival of the 21st Division, which had taken over the section Meudon—Sèvres in the middle of October, the V. Corps had closed up on its left wing. The 10th Division had therefore only occupied the line from the paddock to the Seine, and the 19th Brigade (which was in the first line on the 21st) had, on its right, the 6th Regiment at La Celle St. Cloud, with its 1st Battalion on outpost from the paddock to La Jonchère, and on its left the 6th Regiment, with one battery and one squadron, in Bougival.

At 8.30 a.m., the guns of Mont Valérien opened a brisk fire on the ground South-West of Rueil, and the working parties employed on the entrenchments in the front line of the V. Corps. At 1 p.m., Ducrot brought up his 120 field guns, which extended from the West of Rueil to Fouilleuse and Briquetterie, at a distance of about 1,900 yards from the German outpost line, and concentrated their fire on Malmaison and Bougival. Between 2 and 3 p.m., the columns, having previously deployed, commenced the attack. The outposts of the 19th Brigade fell back from Malmaison and Buzanval; the Brigadier placed all his available Infantry in a position extending from the Seine to the North of Bougival, and over the hills of La Jonchère to the Cucufa Valley. The battery with the outposts came into action at the barricade of Bougival; another battery which came into action at Metternich Park, had to be withdrawn after firing a few rounds. The outpost battalion of the 6th Regiment assembled in the previously prepared fighting position proper at La Celle St. Cloud and the Empress' Kiosk.

The batteries on the French right advanced to within 1,200 yards of Bougival, and the Zouaves made their way into the park of Malmaison, but the Infantry attack was checked at its Western edge, and at the Eastern edge of the Cucufa Valley. With commendable boldness the French Artillery sought to assist the stationary action which developed after 3 p.m., by advancing up to the firing line South-East of Malmaison, and beyond the Porte de Longboyau. But the

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Prussian line was reinforced by two companies of the Guards' Landwehr from St. Germain en Laye, and by two battalions of the 50th Regiment. The energy of the French gradually waned, and a counter-attack made by the Prussians at 4 p.m. forced them to retire, leaving two guns behind them.

Although this sortie must be considered to have failed, Ducrot did not allow it to prevent him from commencing the fortifications he considered necessary on the lower terrace of Mont Valérien. At Moulin des Gibets and Moulin de Rueil, strong gun positions for 5.9″ and 6.3″ guns were constructed, and their flanks protected by Infantry entrenchments at Briquetterie, Fouilleuse, and Maison Crochard.

The Governor had sought to assist this sortie by simultaneous demonstrations in other directions. Blanchard's Division had been directed to advance on Châtillon and Bagneux, Maud'huy's on L'Hay and Choisy le Roi, that of Exéa on Créteil, without producing any remarkable effect. But it is worthy of remark that three battalions crossed the Marne below Nogent, and advanced on Le Plant and Champigny. Although they found the German outposts too strongly entrenched and returned to the right bank, this incident is to be noted as the first attempt of the garrison to set foot on the peninsula of Champigny. Finally, without meeting with any opposition, the 8th *Regiment de marche* took possession of the village of Neuilly-sur-Marne, and thus marked the commencement of the advance of the garrison to the East.

By the end of October the line of defence had been organized into four sections—the first extending from Villeneuve la Garenne to Point du Jour, under General Ducrot, with the 14th Corps already considerably reinforced, the advanced troops along the left bank being commanded by Berthault; the second section, extending from Fort Issy to Nogent, under General Vinoy, with the 13th Corps, of which Exéa's Division was detached on the right bank of the Seine, and reinforced by one regiment of Gardes Mobiles; the third section, from Rosny to Romainville, under Rear-Admiral Saisset, with the garrison already detailed; and the fourth section, comprising Aubervilliers and St. Denis, under General Bellemare, with three brigades.

Neither Admiral Saisset nor General Bellemare had been idle, but had constantly harassed the German outposts, and reconnoitred their position. The latter allowed them plenty of room to move about, as it ran from Le Bourget, along the railway embankment, to Sèvran, and the outlying villages were only visited from time to time by patrols. The French consequently gradually set about establishing themselves there, and displayed more and more energy in their operations both at Bondy and Drancy. By means of repeated reconnaissances, they had assured themselves of the fact that, owing to its exposure to the guns of the fortress, Le Bourget was only weakly held, and this led Bellemare, on the 27th October, to entrust the Volunteers of the Press with a more thorough reconnaissance. According to the official account, the French prepared for this operation by entrenching themselves about 800 yards from the village that same evening. Although this was evidently observed by the German

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garrison, no sufficient means seem to have been adopted to guard against surprise. The village, which was large, and not well adapted for defence either as regards position, shape, or construction of its houses, was only garrisoned by one company when it was surprised on 28th October at 5 a.m., when it was still dark. Besides the Volunteers, Bellemare had brought up three more battalions, and protected his left flank by the heavy guns in the batteries at La Courneuve.

After the Prussian company, slowly retiring, had quitted the place, the French began to fortify it, and got three guns, which had taken part in the attack, into position. Simultaneously with General Bellemare's sortie, Saisset had sent a battalion to Drancy, which it found unoccupied, and began to prepare for defence.

The Prussian batteries opened fire on the guns used during the sortie, but were themselves engaged by the guns of the fortress, so they ceased fire at 4 p.m. In the evening a battalion was sent forward to reconnoitre Le Bourget, but was received with rapid fire from the strongly fortified outskirts, and retired to Pont Iblon with considerable loss. As the French displayed the unmistakable intention of holding the place, the Prussians first of all tried to drive them out by gun-fire. On the 29th, 30 guns opened fire on it from Pont Iblon, but although they continued their exertions for several hours they achieved nothing.

The General Commanding the Guards' Corps was not inclined to take any further steps to recapture the village, which could in any case hardly be held for good under the fire of the fortifications of St. Denis, but the Crown Prince of Saxony gave direct orders to retake it, and so it was attacked and captured on 30th October.

The 1st Guards Infantry Division was held in readiness beyond the Croult brook, the 23rd Division on the bank of the Ourcq Canal, whilst five batteries opened fire at 8 a.m. from Pont Iblon and Le Blanc Mesnil; at the same time the left column, under Colonel von Zeuner, consisting of 2½ battalions, 2 batteries, a troop of Lancers, and a detachment of Engineers, moved off from Le Blanc Mesnil. Half an hour later the other two columns marched off, in the centre, from Pont Iblon, Colonel Count von Kanitz, with 4 battalions, 3 batteries, ½ squadron, and 1 company Engineers; on the right, from Dugny, Major von Derenthall, with 2 battalions and 1 troop Lancers.

In spite of heavy fire, the first line of the centre column (the 2 Grenadier battalions of the "Königin Elisabeth" Regiment) succeeded in making their way into the narrow Northern edge of the village, and in overcoming the obstacles with the assistance of the Engineers. A stubborn house-to-house fight ensued, in which they worked their way up the West side of the main street as far as the church, where they met the Fusilier Battalion of the "Kaiser Franz" Regiment, the leading battalion of the right column, which was making straight for the church from the West. East of the main street, the second line of the centre column (the Fusilier battalions of "Königin Elisabeth" and "Königin" Regiments) had to capture the various farm buildings, which were surrounded by high strong walls, and most stubbornly defended. By 10 a.m. the whole

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of the Northern part of the village, except the farm buildings adjoining the park, were taken.

The left column had advanced against the East side of the village on a broad front; finding itself taken in flank from the embankment and Drancy, it seized the former by a smart rush, and advanced against the sheep-farm, which formed the principal point of support on the South bank of the Mollette. It surrounded and captured it, and was therefore soon in possession of the whole of the Southern part of the village, and was then free to assist in the attack on those buildings in the Northern part that were still held by the French. Fighting went on till after midday, since the surrounded garrisons continued their resistance with ever-increasing ferocity. It was nearly 1.30 before the victorious troops marched off to their headquarters, leaving 2 battalions behind as garrison.

The 2nd Guards Division had gained their victory with a loss of some 500 men, among whom were many officers. The French lost over 1,200 prisoners, but the number of dead and wounded is not known.

After completing the investment of the fortress on 19th September, the Germans lost no time in considering the steps to be taken towards its capture. The Inspector-General of Artillery, General v. Hindersin, and the Acting-Inspector General of Engineers, Lieut.-General v. Kleist, had been called upon to report on the matter, and after reconnoitring the fortifications from the 26th to the 28th, had, on the 30th, submitted in writing the following report:—

1. A mere bombardment, as the most recent events had proved, very seldom led to the capitulation of a well-defended fortress, and would, considering the position of the forts and the great extent of the city of Paris, prove of but doubtful value.

2. In the case of a regular siege, the dominating heights of Montreuil need not be considered, especially as, even after the capture of the forts, the ground to be traversed was very difficult and much built upon.

3. The fortifications of St. Denis afforded a generally favourable objective, and the Western works of these defences could be taken in rear from the peninsula of Gennevilliers.

4. There was sufficient room between the works of Mont Valérien and the town of St. Denis to develop the attack, but the passage of the two arms of the Seine presented great difficulties; in this case the early capture of the peninsula of Gennevilliers was necessary as a preliminary measure.

5. The conditions most favourable for the attack were to be found on the South side, and the forts against which it should be directed were those of Issy and Vanves, as an advance on Bicêtre and Ivry necessitated the previous capture of the heights of Villejuif.

Having regard to these considerations, the two Generals recommended that the main attack should be directed against Vanves and Issy, and that a secondary attack should be made against the North-

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West Fronts. The first steps would therefore be the capture of the peninsula of Gennevilliers, and the establishment of the first batteries on the heights between Châtillon and St. Cloud.

But Major-General Schulz, who had to report on the conditions prevailing in the district of the Third Army, stated that, in his view, the attack between the Upper Seine and the Bivière, though more difficult at first, would in the latter stages be more certain and easier than to the West of the Bivière, and that the attack should therefore be directed against the heights of Villejuif, and then against Bicêtre and Ivry.

On the 9th October the King's decision was communicated that the main attack was to be directed against Fort Issy, Vanves, and Montrouge. For the time, nothing was decided with regard to the secondary attack; but as, before the end of September, the Army of the Meuse was ordered to advance its right wing on to the peninsula of Gennevilliers, it was to be inferred that such an attack was to be carried out in the manner suggested by the two Inspectors-General. Probably, the only point that was still doubtful was whether, having obtained possession of the peninsula, a direct attack was to be made upon the enceinte, or whether the subsequent operations should be limited to the support of the attack on St. Denis.

In any event, the order to push forward troops on the peninsula was of the greatest importance. What, then, was done towards carrying it out?

On 1st October the Senior Engineer Officers of the Army of the Meuse reconnoitred the Seine, and discovered that the most favourable point at which to cross it was situated between the two demolished bridges at Argenteuil. On the 2nd October, orders were issued that all suitable boats were to be collected at Bezons, a strong boom was to be thrown across the river at Argenteuil, and the villages, fortifications, and dykes of the peninsula were to be reconnoitred. On the 3rd, orders were issued for the garrison of Argenteuil to be increased by one battalion and two heavy field batteries, emplacements for the latter to be constructed on each side of the town, and for a battery of six heavy field guns to be placed on Mont Plâtre. In order to provide for the security of the latter, the outpost line was advanced to Epinai, and this place was fortified.

During the night of the 3rd-4th, the officers of the Engineer Staff and of one Engineer company discovered that the uncompleted works and Gennevilliers itself were unoccupied, but that a strong and watchful garrison prevented anyone from entering Colombes.

It was necessary to prepare for a rapid crossing of the river in great force in order to take possession of the peninsula in the face of the French troops, who were gradually re-occupying it. For this purpose the bridging materials of the Army of the Meuse were insufficient, the more so, since the XII. Corps had left its pontoon train at Metz—that of the Guards, with the Engineer Company, was placed at the disposal of the IV. Corps, and parked at Sannois on the 5th October; moreover, only 63 boats of sorts had been collected, which could take 340 men. So other means of crossing the river had to be devised. On the 8th, the Engineers of the IV. Corps commenced

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the construction of a bridge of barrel piers 240 yards long, and got it into the water, in parts, on the 17th. Those of the Guards made one of rafts, which they finished on the 17th. In addition, a flying bridge was made of 8 small rafts, of which the superficial area was 218 square yards. But it was above all things necessary to provide a means of getting the heavy vehicles of the siege train over the river, and for this purpose the 1st Company of the Guards' Engineers commenced the reconstruction of the road-bridge destroyed by the French. It consisted of 7 spans of wooden arches, each over 25 yards long, of which two had been burned down next to each bank, and had to be replaced.

Fortunately, timbers of sufficient size were found in Argenteuil, and during the nights of the 11th and 12th, the first span could be put in. But in the meantime the French had re-occupied Courbevoie and Asnières, and the fire of the 4.7″ guns mounted in the former place prevented the construction of the remaining three spans; and the timbers could only be placed in readiness at the approach to the bridge.

Simultaneously with these preparations, the boom was made which was to secure the passage against the operations of the Seine flotilla. First of all, a chain was fixed to the piers of the railway bridge; but this did not appear to be sufficiently reliable, so it was decided to blow up the Western, undestroyed, portion of the bridge in such a manner that the girders should fall and block the channel. But the concrete of which the piers were made was as hard as rock, and cased in thick iron plates, so that the work, which was begun on the 8th October, was not successfully accomplished until the 21st. By this time the peninsula was completely re-occupied by Ducrot's troops; the siege guns, without which the German Generals did not think they could hold out on the peninsula, had not yet arrived; so on the 23rd, work on the bridges was stopped, and for the time being the project of crossing over to the peninsula was allowed to drop.

The preparations for the crossing had been further marked by a redistribution of troops. On the 11th October the XII. Corps had extended its right wing to Aulnay, and the Guards had extended theirs to Graulay, so that the IV. Corps could tell off a whole brigade of the 8th Division to hold the peninsula of Argenteuil (as had, by the way, been ordered as early as the 15th September), and could hold the rest of that Division in reserve between Sannois and the Lake of Enghien

In the district of the Third Army, a few changes also took place at this time. As already mentioned, the XI. Corps arrived, still weak in numbers, on the 23rd September, and took over the section between Choisy le Roi and Bonneuil, in consequence of which the VI. Corps could concentrate all its four brigades on the West of the Seine. The I. Bavarian Corps, which arrived at Longjumeau on 22nd September, did not long remain with the Army of investment. It was joined by the 22nd Infantry Division, and marched Southward on the 6th October, in order to cover the investment against the new French troops that were being organized in the Valley of the Loire. On the other hand, on the 10th October the 17th Infantry Division

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arrived, followed on the 16th by the first regiment of the Guards' Landwehr Division, called up from Strassburg. The former relieved the 21st Division on the right bank of the Seine, which was told off to the section between Meudon and Sèvres, in order to assist the V .Corps, which was thus able to concentrate more towards the West. On the 30th, it was found possible to concentrate the Guards' Landwehr Division at St. Germain en Laye, its last units having arrived at Longjumeau on the 29th.

The reinforcements received by the Army of investment, exclusive of drafts, thus amounted to 3 divisions, with, altogether, 38 battalions, 20 squadrons, 114 guns (including the Corps Artillery XI. Corps), and 3 companies of Engineers. The states of the 31st October show a strength of 168,687 Infantry, 12,980 Cavalry, and 672 guns.

In the matter of siege stores, the situation was by no means so favourable. When undertaking the siege of the great fortress, the heads of the Army were perfectly aware of the fact that a large force of Artillery would be needed to effect its capture, and had estimated their requirements at 300 heavy guns. When Moltke's order of the 8th September arrived, the Artillery section of the War Office was already engaged in making up a new siege train, as the one prepared in time of peace had already left for Strassburg, and for the investment of Metz, 50 4.7″ guns had already had to be taken from the armament of the fortresses. By the end of August, the arsenals of Magdeburg and Cologne had already prepared 100 4.7″ and 60 5.9″ guns, and 50 heavy smooth-bore mortars were available in the fortresses on the Rhine. When General v. Roon passed on Moltke's order by telegram, on the 10th September, and at the same time demanded 10 5.9″ and 16 4.7″ guns for Toul, these 210 guns, with their initial equipment of 500 rounds of common and 50 shrapnel per rifled gun, were ready for immediate despatch. On 13th September, the mobilization of the available transport and of 20 companies of Fortress Artillery was ordered. The siege train, increased by 15 short 5.9″ guns (of which, in the meantime, 27 had been completed), and by six rifled 8.25″ mortars, started on the 28th. Toul had by that time capitulated, and so the journey could be continued right through to Nanteuil.

[1] The Siege Artillery Park contained:—

40—3·57″ rifled guns 84—4·7″ „ „ 50—5·9″ „ „ 15—5·9″ short rifled guns 6—8·25″ rifled mortars	195 rifled pieces.
20—11″ mortars 20—25 pr. shell guns	40 S. B. pieces.

This number was not sufficient to engage the extraordinarily

[1] This composition does not follow from the preceding paragraph, and in the original contains the further clerical error of 194 rifled guns. The discrepancy is not explained in the original.—*M.H.C.B.*

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well-armed forts with any prospect of success, and had, moreover, still to be transported to Paris from Nanteuil, where the construction of the railway loop-line was not commenced until after the siege train had arrived there. By employing the teams of the Field Artillery and Field Ammunition columns, it was found possible to get the guns into the park opposite the South front, but not the ammunition, for which a large number of vehicles were needed. And suitable ones were not to be had. The Field Ammunition columns could only spare their wagons and teams for a short time if they were to be ready for duty in the field, and this, owing to the constant menace of the Army of the Loire, seemed absolutely necessary. Neither could the Supply columns be utilized for the purpose, as they were indispensable for ensuring the regular supply of the troops, and the journey from Nanteuil to the park at Villacoublay and back took eight days.

Thus it came about that the guns stood there ready, but got no ammunition, which was at Nanteuil; and when the second instalment —despatched on 21st October—arrived there, the first had not yet left. It was impossible to procure transport for it.

As soon as Major-General Schulz was appointed Chief Engineer of the South Attack, on the 9th October, he proposed the transfer of the Engineer Park from Strassburg. Its despatch from the latter place was reported on the 24th, but, again, there were no wagons with which to transport it to Petit Bicêtre, where it was to be established. This difficulty was got over by emptying the entrenching tool wagons of the V., VI., and XI. Corps and the company wagons of the Engineer companies, and sending them to Nanteuil on the 25th. As four companies of Fortress Engineers arrived with the park from Strassburg, each convoy was accompanied by one of them. By this means the first convoy was got up on the 2nd, the second on the 13th, the third on the 24th November, the fourth on the 5th, the fifth on the 19th, and the sixth[1] on the 29th December, the last two starting from Lagny, as the railway had by then been opened as far as that point. Even then there remained at Lagny the mining frames and 6,000 spades. But they were not needed, especially as after the arrival of the second convoy, on the 13th November, there was a sufficient supply of all the stores required for commencing the regular siege.

On the 11th and 12th October, four companies of Fortress Engineers arrived, having up till then been employed on railway construction. But as these were by no means sufficient to carry out the preliminary work, the two Sapper companies of the V., VI., and XI. Corps were placed at the disposal of the Chief Engineer on 12th October; but the two last were at the time away with the 22nd Division. The 2nd Company of the XI. Corps arrived on 20th October. Finally, on the 25th October, the Fortress Engineer company of the Guards' Landwehr Division was allotted to the attack, so that, at the end of that month, Colonel Klotz, who had been appointed to command the Engineers, had under his orders 5 Field and 9 For-

[1] From the preceding sentence it is not quite clear where the 5th and 6th came from.—*M. H.C.B.*

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tress Engineer companies. The strength of the Fortress Artillery by the middle of November amounted to 24 companies.

The provision of the necessary materials, such as gabions, fascines, etc., was at once commenced, the Corps of the Third Army being ordered to make them, and on the 5th November the stores in the park were amply sufficient for the commencement of the regular siege.

Colonel Rieff, who commanded the Siege Artillery of the South Attack, ordered the construction of the siege batteries to be begun on 22nd October. There is no need for any further discussion of them at this stage, as they were not used before the Artillery attack began. Their distance from the forts varied from 2,100 to 3,200 yards; owing to the difficult soil they required considerable labour for their construction, and the long spells of rainy weather necessitated very tedious draining operations, as the ground was absolutely impervious to water. But as the excessive delay in arming the batteries was due to the lack of ammunition, no great harm was done, and there was ample time to thoroughly complete the batteries with all their blindages, bomb-proofs, and communications. But by the end of November they were finished.

DISCUSSION.

The discouragement which seized the Parisians on 19th September, and led the Governor to so completely abandon the foreground, did not last long. As the besiegers made no use of the opportunity offered them, the mood suddenly changed, and gave way to a lively spirit of enterprise. It can hardly be supposed that Trochu recognised his errors in regard to the section garrisons and the General Reserve, but he now at any rate employed the latter on the two fronts where, owing to the absence of a section garrison, it was most urgently required. To tell off a section garrison at that time was hardly possible, and had to be postponed until the further organization of the available forces, which was being energetically pushed forward, should have made such progress as would render a fresh distribution possible.

In the formation of these new commands, it was rightly considered a matter of importance to accustom the newly-raised regiments to strict order and fire-discipline by brigading them singly with the more steady and coherent units of the two Army Corps and the Marine garrisons. This result could not have been arrived at by the formation of large commands composed entirely of new troops. At the same time, by sending more and more of the Gardes Mobiles to posts outside the city, as was especially done on the West side, they were withdrawn from the undoubtedly harmful influence of the populace. A French author reproaches the Government with having sent the Gardes Mobiles to fight the enemy before they had been able to fire a round of ball ammunition; but the answer to that is that

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it was by no means easy to carry out target practice with the long-range rifle. Besides, in several instances, as at Bagneux, the Gardes Mobiles did very well indeed.

Whether we agree or disagree with Ducrot's intentions in raising a strong Fortress Army, it must be admitted that the organization of it was indeed a great feat; for here we have a fact without parallel in military history—that the forces of a blockaded fortress, instead of dwindling away, grew to such an extent that they eventually outnumbered those of the besieger.

Before the Army could become fit for service in the field, a considerable time was, of course, bound to elapse; and for so long the garrisons of the North and East sections, and the two Corps of Vinoy and Ducrot, had to carry out the double duty of keeping off the enemy and of bringing about conditions as favourable as possible to the operations the Fortress Army was eventually intended to engage in. That their task was rendered particularly difficult by the investing Army can hardly be maintained.

If the improvised works on the West and South owed their inception to the recognition of the fact that on these fronts the line of forts permitted the besieger to approach and utilize points of special importance, and if the possible consequences of their hasty evacuation on the 19th September were rightly gauged, the first duty of the garrison undoubtedly was to attempt their recapture. The employment of the Army Corps was therefore obviously correct.

On the South, the problem was to recapture ground of which the possession by the enemy endangered the safety of the fortress in the highest degree; whilst assuming the offensive, therefore, the XIII. Corps had always to remember the purely defensive object of its operations. Through the backwardness of the VI. German Corps, which can only be explained by lack of understanding of the problems of fortress warfare, General Vinoy gained in the important heights of Villejuif a position which not only formed a part of the one to be recaptured, but could also serve as a strong base for a further advance against the heights of Bagneux and Châtillon. Vinoy utilized it perfectly correctly. He completed the redoubts with all the means he could lay hands on; he armed them as rapidly as possible with heavy guns, and eventually produced such a system of continuous Infantry and Artillery defences, that in a short time the position could have been held against a very energetic attack. But such an attack was never even attempted; although the report of General Schulz pointed out the great importance of this section for the further progress of the attack, the question of its seizure does not even appear to have been considered; at any rate, no steps were taken which could have led up to or facilitated it. No attempt even was made to hinder the extension and arming of the works, although the effect produced on 23rd September by the three batteries that came into action at L'Hay and Thiais constituted a direct challenge to try and see what results the Prussian Field Artillery could obtain in fortress warfare under favourable conditions; for in the Official Account (Vol. II., 160) we read that the fire of the French heavy guns in the forts and in the advanced positions "had, by 9 a.m.,

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gradually slackened off owing to the effective fire of the Prussian Artillery," a sign, not that the heavy guns were defeated, but that they could not defeat the field batteries. This is also proved by the slight losses of the latter, amounting to five wounded. Neither from Fort Ivry nor Bicêtre could a view of the foreground be obtained, and against Montrouge it was easy to find cover. Here was an opportunity, not often found in a siege, for bringing up a strong force of Artillery for prolonged action against the heights of Villejuif, and for so bombarding the French works before they could be completed as to render their assault feasible. Instead of this, the temporary success achieved by the batteries was considered sufficient, they were withdrawn after the effectiveness of their action had become apparent, and the French, whose task could only be performed with great labour, and was necessarily accompanied by the accumulation of large numbers of men in a small space, were left entirely alone.

We may well be astonished, and ask if such a thing would have been possible in the field, and what was the cause of this apathy concerning the doings of the enemy, the progress of whose works could be seen and watched from L'Hay. The fact was that both Commanders and troops found themselves 'placed in such entirely new and unaccustomed circumstances, that they shunned independent action of any kind, and merely waited for orders. But as the latter merely prescribed fortification of the position, and keeping out of the way of the guns of the fortress, bold action, which everyone would have taken in the field, was avoided, and nothing was done which might conceivably lead to collision with the garrison. To have been consistent, the besiegers should have abandoned the whole of the front line as soon as the heavy guns of Hautes Bruyères and Moulin Saquet opened fire, and fallen back on Rungis and Orly. But fortunately they were saved from such a step by the old Prussian spirit, which does not allow anything to be lightly abandoned when once it has been seized.

In Tripier, Vínoy found an intelligent and clever assistant. Basing his left wing on the position he had won with so little difficulty and danger, he commenced sapping up to Bagneux, and having got within half a mile of that place, he started the excellently prepared and energetically and cleverly executed assault of the 13th October.

It seems quite probable that Vinoy would have attained his object, and obtained permanent possession of Bagneux, if Trochu had not been so wedded to Ducrot's scheme, and had left him a free hand. Charrière's brigade had not yet been engaged, and Dumoulin's brigade was ready to assist if necessary. The guns of the forts, moreover, maintained so heavy a fire on the plateau that the Bavarian field guns could not face it, and were thus unable to prepare the way for an attack on Bagneux. One lesson we can specially lay to heart is the rapid preparation for defence of that village. The rear (North side) was opened up as fast as the front edge was got ready for defence. The technical and fighting troops worked hand in hand on this occasion, as they did every time a sortie was made, and just as at Châtillon, on the 13th October, we find the Sapper with pick and shovel helping the Infantryman to open up communi-

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cations and make cover, so he is seen at Le Bourget, on the 28th, constructing in the shortest possible time a defence against which a heavy bombardment by 30 field guns proved futile.

The object of Vinoy's sortie of the 30th September is less apparent. The supposed bridge at Choisy did not exist, and he might almost have known by himself that it could not exist. The capture of the position held by the most advanced Prussian troops was of no value to the defenders, since their own was more advantageous in every way. The only object, therefore, can have been to accustom the men to being under fire, and to stop the mouths of the grumblers in Paris. But in that case, so tenacious a defence as that of Chevilly was quite unnecessary. It could only lead to heavy losses, as the event proved. The reproach, made both to Vinoy and Trochu, that their sorties were devoid of a definite purpose, is therefore justified in this case. For Trochu, a few hundred men more or less did not much matter; he had men enough and to spare. In any defence that had to work with more limited resources in men, such aimless enterprises would be far more reprehensible. Important as it is under all circumstances that the defence should be conducted actively and offensively, as far as the available resources will permit, it is usually necessary to adhere strictly to the principle that all enterprises must conform to a settled plan, that each one must be directed against a definite objective for a distinct purpose, and that the means employed must be commensurate to the object to be attained. The attack on Bagneux was as much part of a sound scheme as the sortie on Choisy was aimless. But besides that, Trochu had done his best to make the latter fail.

Since everything in Paris was on such an enormous scale, it was the Governor's place to give his individual subordinates, like Ducrot, etc., exact instructions as to the objects to be attained by each. These should have been made to correspond with his plan of defence. If he approved Vinoy's intentions with regard to the improvised position on the South, he should, while holding him responsible, have given him a free hand in deciding upon the means and the time for carrying them out. If he did not approve them, if they did not fit in with his scheme, he should have left no room for doubt about it. If Vinoy proved incapable of furthering the Governor's plans whilst acting independently, he should have been relieved by someone else.

Trochu, however, kept complete control of everything, down to the smallest detail, in his own hands, and not only issued minute dispositions for every enterprise, but also settled the time for its execution, a proceeding which is, as a rule, only feasible in the case of big combined operations, in which exact timing of the subsidiary actions has to be arranged for. Indeed, he went even further; he foisted on the Corps Commander a Council of War that had nothing to deliberate on, and utilised the time taken up by its meetings in giving his orders in the forts in person. In this way he created a number of mutually independent commands, that were responsible to him alone, and whose proper action and co-operation could no longer be ensured by the General in immediate charge of operations, and was therefore rendered doubtful in case of any unforeseen occur-

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rence. Vinoy's complaints, repeated on several occasions, of the friction that arose between the different officers, who were responsible to no one but the Governor, were thoroughly justified. The faultiness of this clumsy organization established by Trochu showed itself on every occasion.

Greater independence was enjoyed by Ducrot, who is said to have made the arrangements for the sortie of the 23rd October himself. Whilst Vinoy's advance served to strengthen the defence, Ducrot's scheme was offensive in character, and, assuming the possibility of breaking out, his dispositions were in every way suitable. They were not less so from the point of view of the pure defensive. The occupation of the peninsula of Gennevilliers was of the greatest importance to the defence; for, apart from an attack on the North-West fronts, which might prove very embarrassing, it could afford the besiegers very great advantages in an attack on St. Denis. The Northern works of this town, which had open gorges, could be so taken in reverse from the peninsula as to be absolutely untenable.

We are here confronted by the following questions:—Was it right for the besieger to employ the reach of the Seine from Croissy to Epinay as an obstacle, and to leave a gap in his line of investment? Would it have been possible for him to take possession of and hold the peninsula, even before the arrival of the heavy guns? I will attempt to answer them in succession.

At the investment of Metz there were, not one, but several, gaps in the besieger's position on the right bank of the Moselle, without there being any compensating obstacles to movement on the part of the defenders. Whilst due to strategical considerations, they did not prove to be sound, and gave rise to critical situations and much shifting about of the troops in the position, which could certainly not be described as an advantage. But the example of Metz cannot be described as normal, inasmuch as a Field Army was shut up in the fortress, as well as the regular garrison.

In the case of Paris, the troops at the disposal of the defence up till the beginning of November, may be considered a normal garrison, since it must never be more than an absolute minimum. If the besieger did not intend to attack either the fortifications of Mont Valérien, nor the West fronts of the city, nor yet St. Denis, the peninsula of Gennevilliers was no use to him whatever. The problem was to seize as much ground in front of the fronts to be attacked as could be captured in the first rush, to utilize it as a base for further advance, and to hold it even at the cost of heavy losses. On the sides it was not proposed to attack, energetic advance was only desirable if it was possible, and intended, to deceive the defender as to the true direction of attack by so doing. Under these circumstances, it was only necessary to occupy the peninsula of Gennevilliers temporarily, if at all; and since at this point the Seine afforded excellent frontal protection, it was quite sufficient to merely observe the obstacle so long as the defender showed no intention of assuming the offensive. But even then it would have been enough to have converted the next reach of the river into an obstacle by the removal of the means of passage, and to have prevented the defender from coming out of the

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peninsula of Argenteuil by preparing a position on the ridge running from Cormeil to Sannois, which lay right across it. In fact, the circumstances of this particular case supplement each other to the most extraordinary extent, and seem to demonstrate the feasibility of dispensing with an absolutely continuous fortified line of investment. That a gap in the investing position can, however, only be justified by particularly favourable circumstances, and then only on a front which, for strategical reasons (in future the determining ones) is not to be attacked, should be conclusively proved by this siege of Paris, in which all parts of the line of investment were attacked, and in which very unfavourable situations would often have arisen if any exposed flanks had been caused by leaving gaps in the line.

I said that the seizure of the peninsula of Gennevilliers was unnecessary so long as the plan of attack did not contemplate a line of advance in which it would play a part. But no such plan of attack existed. It was therefore imperative to occupy it—unless lack of troops prevented it. We have already seen that by putting off the investment for a few days, sufficient troops would have been obtained.

But now the reports of the Artillery and Engineer Officers made the importance of the peninsula so clear, that the subsidiary attack on St. Denis was probably temporarily left undecided simply because it was uncertain whether the available Artillery would be sufficient. Its usefulness was already recognized, and later on it was actually started, but without occupying the peninsula, that being by that time beyond the strength of the besiegers.

Early in October, when the plan of attack was drawn up, it was still possible to make good the neglect, and it was intended to do so, as is indicated by the order sent to the Army of the Meuse at the end of September to push forward its right wing on to the peninsula of Gennevilliers. Why was it not done? Because the preparations for the passage were not completed till the 21st October, a full three weeks, and by that time it was too late. It seems as if people thought that in a siege one could work with weeks instead of days, or, rather, hours. If the Army of the Meuse had received orders on the 15th September to occupy the peninsula with a brigade on the 19th, are we to suppose that it would have taken three weeks over that, too? Why should that time be required now, when but little change had taken place in the situation, and when reconnaissances had revealed the fact that the peninsula was for the most part not occupied by the enemy?

If the order arrived on the 30th September, the pontoon column of the Guards could be brought up, and other materials got ready on the 1st October. On the 2nd, or at the latest on the night of the 3rd, the passage could be made. One brigade would be sufficient for the beginning. If two battalions were taken across with the materials at the disposal of the Engineers, and in the boats to be found in the neighbourhood, during the night, one bridge could have been completed, at the latest, 1½ hours later, and the rest of the brigade, with one regiment of Cavalry, and, say, four batteries (length of the column 3,850 yards), could have crossed in three-quarters of an hour. A second bridge could have been got ready a little later for the passage

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of a second—reserve—brigade. In all this there was little difficulty.

Was this prevented by fear of the gunboats? The barricade across the river, which was needed as a defence against them, took till the 21st October—a most excessive time—to finish. But the feat might have been risked without it. But there was another reason —the passage was not to be effected till the heavy guns had arrived. In that case, of course, there was plenty of time, and no need for hurry. With that matter we will deal later. But we have the right to inquire whether it was thought necessary to wait for the guns in order to proceed immediately to the attack of the forts of St. Denis, or was it considered impossible to hold out on the peninsula without their support?

There would have been little sense in the former course, since the investment had been effected without opening up the railways required for their transport. We can further say without hesitation, that they were not absolutely necessary to maintain the position on the peninsula, as it was only necessary for the position to be as near Mont Valerien at this point as it was at La Celle St. Cloud, that is to say, it might follow the railway embankment to Charlebourg—La Folie being held as an advanced post—utilize the ridge along the left bank of the river from Courbevoie to Asnieres, and then bend back to Gennevilliers. The peculiar manner in which the ground slopes down from South East to North West afforded cover from the enceinte of the town from which the position could not be more than 2,700 yards distant in order to observe and command the Seine.

The peninsula of Gennevilliers could and should have been seized before the defender re-occupied it.

This was done by Ducrot, cautiously and slowly pushing forward one battalion after the other, and advancing from point to point, by the 17th October. Then, having made the position absolutely secure, he attacked the Prussian position at Bougival. It can hardly be maintained that sufficient grounds existed for this operation, it was at any rate not necessitated by the preparation of the position on the low terrace of Mont Valerien. The defender must have observed that the besieger was averse to advancing a single yard from his position, however tempting the bait held out to him. It was not to be expected that he would in any way seek to prevent the construction of the batteries so close in front of the heavy guns of the fort; it was moreover more difficult to prevent such works here than elsewhere, since the powerful guns of the fort would not have permitted such interference on the part of the Prussian field batteries, and other means were not at his disposal.

The points to be noticed in connection with the sortie of the 21st October are, on the one hand, the effective introduction by means of the imposing force of artillery, and the almost too bold advance of the French artillery into the lines of the infantry, and on the other, the repulse of the attack in the outpost position on the Cucufa Ravine instead of in the main position prepared for the purpose on the edge of the plateau of La Celle St. Cloud. Only the advanced villages of Malmaison and Buzanval, which were observed rather than held by the advanced troops, were abandoned, so that the garrison actually

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advanced to meet the attack, whilst the defensive position proper was occupied by the other brigade of the division as a second line. This afforded the advantage that the individual supporting points could not be surrounded as had been the case in the sorties of the 30th September and 13th October. This attack had to be a purely frontal one, and an attempt to get round the flank by way of Buzanval was met by a counter attack by one battalion. As on the 13th October so on the 20th. The support afforded by the fortress guns was most marked; the besieger's field guns were smothered by them. From this it is evident that the investing position should have been considerably further from the works of the fortress if it was really intended to be beyond the effective range of the heavy guns.

From this it follows that in an investment heavy artillery cannot be dispensed with unless troops are to be exposed to heavy losses from the fire of the guns of the fortress which can be concentrated at will on any point by the defender; further, that this fire can only produce decisive effect when it is concentrated for definite tactical purposes; and that, in consequence, the investing position need not be selected with too great consideration for them, since it is unreasonable to expect such security and rest as was obtainable in this position in the days of the smooth bore guns, and it seems better to consider the unavoidable losses as the price of the ground that must in any case be won later on and then at increased cost.

The doings of the besieger up to the end of October do not call for much comment. He remained in his position, and sought to strengthen it as much as possible, That this took a long time was due to the inadequate training of the infantry in field engineering, and to the want of technical troops. For the latter had to be more and and more withdrawn from the field troops in order to prepare for the attack since their organization made it impossible to employ strong bodies of Fortress Engineers. When no source of supply has been arranged for in time of peace, a large output will not be forthcoming in time of war. Of the 20 available companies of so-called Fortress Engineers it was found possible to bring up 13 during the siege—but not before the fall of Strassburg. Of what use could they be for the attack of a fortress like Paris? And as early as the beginning of October, 6, and later on, nearly all the field companies had to be taken from the field troops in order to carry out the most urgent work, and then only in the most perfunctory manner. On this matter I have already expressed myself (Vol. 1, pp. 83 et seq.). At Paris matters were not a scrap better than they were at Belfort. Thanks to the bad weather and the absolutely impervious soil, the roads and paths required for the attack on the south fronts were soon in an indescribable condition, and with the exception of the great paved road to Versailles, absolutely impossible to use. This was but one point which alone affords a sufficiently serious warning for the future. There is only one way of satisfying the technical requirements of

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modern sieges, and that is the creation of a sufficiently strong force of Fortress Engineers.

And now let us turn for a moment to the plan of attack.

It is surprising to note the neglect of strategical conditions displayed in the report drawn up by the Inspectors General of the scientific arms which formed the basis of the plan. We only read of the difficulties in the way of the artillery, and above all of the impediments to the advance of the attack on one front or the other caused by the conformation of the ground and by the nature of the soil, nothing but tactical and technical considerations. Where the batteries may best be placed for carrying out their work is no doubt of great importance, but how the guns and their ammunition may be got there is far more important, for the most beautiful position cannot help us if the ammunition cannot be got to it, and the advantage of shortening the attack by a possible few days by directing it against one particular front is entirely lost if it takes as many more weeks to begin it.

But the conditions were such that it was utterly impossible to make use of any railway leading to the southern fronts. Since the line Chalons to Paris was interrupted at Nanteuil, and would probably remain so for a considerable time, the necessity of bringing up all the siege stores by road transport and the difficulties attending the passage of the Seine had to be reckoned with. And even after repairing the damage at Nanteuil this crossing of the Seine would still remain, the attack would still be based on a single road which, owing to the absence of permanent bridges, was absolutely unreliable; the seriousness of this defect became apparent in the winter when the drifting ice rendered all the military bridges useless. If at that time the bridge at Corbeil had not just been repaired, all connection with the railway and all supplies would have been cut off.

These circumstances should not have been overlooked by the officers in making their report, and should have led them to consider whether the attack of the north or east fronts would not be based more securely and conveniently than that on the south.

The east fronts were approached by two lines of railway, the above-mentioned line from Chalons, and another through Reims and Soissons. The former, even while interrupted at Nanteuil, could be far more advantageously used for the attack of the east fronts, as the Seine had not to be crossed, and the road to Chelles was at least 22 miles shorter than that to Villacoublay. After the removal of the obstacle (in the middle of December), the station of Chelles, situated opposite the centre of the Eastern fronts could be used, whilst the road to the south side was still nearly 38 miles long, that by Corbeil being 47.

The northern line was useless right up to the frontier until the fortresses in the Ardennes had one and all been captured. But the section from Reims to Paris could be connected up to the open part of the southern line by means of the railway from Chalons to Reims. On this line too there were numerous obstacles. The smaller ones at Nanteuil le Haudouin, Mitry and Villers-Cotterets were taken in hand by the army of the Meuse immediately after the investment was completed, and the first two removed by the middle, the last by the

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end of October. The larger ones were caused by the fortress of Soissons and the tunnel of Vitry, it being hardly possible to clear the latter before capturing the fortress, as it is close to it. Here, the most pressing need was to take Soissons. The means of doing so could without difficulty be obtained from the Siege Corps of Toul, since the latter place had fallen on the 23rd September.

The siege stores were despatched from there on the 3rd October, and arrived between the 6th and 9th. The artillery attack began on the 12th and ended in the capitulation of the fortress on the 16th. It must be admitted that considering the unfavourable circumstances (passage over the Marne on a temporary bridge and road transport from Reims), transfer of the stores was effected very quickly, but it would not have been necessary to wait 9 days before sending off the guns if the situation had been more clearly appreciated, and if the despatch of the stores to Soissons had been more hastened by Army Headquarters. (See v. Mueller "The work of the German fortress artillery," II. 122-123). The Tunnel at Vierzy was reopened by the 18th November, and this line was thus available before that from Chalons to Paris, and from the 18th November on, the station of Mitry could be used for an attack on the north or east fronts of Paris as well as that of Nanteuil.

But there was a third line, the more rapid opening of which was by no means impossible. After the capitulation of Laon on the 9th September, the railway Reims—Laon—Creil was only blocked by the small fortress of La Fère. The bridge over the Oise at Creil had, it is true, been destroyed, and could not be restored till considerably later, but a bridge of boats had been made and rails laid on it, so that it could also be used as a railway bridge after getting up the necessary auxiliary locomotives. As locomotives had only been found on the section between La Fère and the Oise, they had to be taken to pieces, taken to Senlis by road and there put together again. This having been successfully accomplished, the whole section from Gonesse to La Fère could from the 17th October, be utilised for the supply of the investing force. All that was now required was the fall of La Fère.

Soissons having fallen on the 16th October, it was a very obvious step to send the whole of the siege stores at once to La Fère, a days march away. Had the report of the two highly-placed officers of the artillery and engineers contained a word of reference to the importance of the early capture of La Fère, this fortress would without a doubt been in German hands by the end of October, and the most northerly railway line would have been open. For on the 16th, General v. Moltke issued orders by telegraph for the attack of La Fère to be commenced forthwith, and to be carried to a conclusion without delay, leaving it however, in compliance with his special request, to the decision of the Grand Duke of Mecklenburg whether Mézières or La Fère was to be taken first. As the latter decided in favour of Mézières, the Staff and Siege Corps who had already marched to La Fère, and the Siege train proceeded to Mézières, where their orders were cancelled, with the result that they only arrived at La Fère after a month's delay. (For details see v. Mueller as above, II. pp. 167). So

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fire was not opened till the 25th November; and the fortress fell on the 27th.

It can hardly be doubted that General v. Moltke would not have modified his original order if the report of the two generals had seriously considered the question of attacking the north and east fronts, and had duly emphasised the importance of capturing La Fère for that purpose. In that case the station at Gonesse would have been available by the end of October. It is plain that the transport of the heavy artillery and ammunition would have been considerably easier, and could therefore have been effected at the latest by the middle of November, if instead of the south, the north and east fronts had been selected for the attack. Since strategical conditions so obviously pointed to these fronts one would think it could not be a question whether others offered greater facilities from a technical or tactical point of view, but whether the attack on the north or east fronts was technically and tactically possible.

With regard to St. Denis there was no doubt whatever that its forts were not capable of much resistance, particularly if the attack was supported from the peninsula of Gennevilliers. But it is hard to understand why the attack on the plateau of Montreuil was definitely set aside from the very beginning. If all fortifications in such commanding positions are to be considered unassailable, the attack will be in a bad way. It is only possible to conclude that the attack on the south seemed so much more promising to the two officers, that that on the east did not seem worth considering at all, that is to say, they actually had no eye for the strategical side, and left the question of transporting the siege stores to the point of attack out of their calculations altogether. By this means they brought about the decision to attack on the south side, they caused the difficulties (insuperable for months) of transporting the ammunition to Villacoublay, they caused the excessive delay in starting the artillery attack, and thereby retarded by a long period the capitulation of Paris. It would be going beyond our limits to discuss the grave consequences of these delays, the difficult situations they gave rise to, and how owing to them, even the final result of the war was rendered doubtful.

The attack on the plateau of Montreuil was not impossible. The heights of Raincy were indeed too distant to be of use in the artillery attack on Fort Rosny, but the top and slopes of Mont Avron offered excellent gun positions at the same height as the plateau of Montreuil. The villages from Bondy to Neuilly Plaisance provided a tenable enveloping position for the infantry, and the heights at Bry sur Marne rendered it possible to engage Fort Nogent from the other bank of the Marne and keep down its fire, and also to completely secure the left flank of the attack.

(e). The Investment up to December 27th.

During the whole of this period of eight weeks, the besieger remained immovable in his trenches; but this passive attitude was

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no longer maintained as in September, of his own free will, but was imposed on him by circumstances created, on the one hand, by the restless energy of the defender, and, on the other, by insufficient preparation and interest for the operations incidental to a siege. We must briefly consider these two factors in succession.

The only change in the situation from the attacker's point of view was the increase of strength that took place in November. On November 9th the 17th Infantry Division marched off to join the 22nd Infantry Division, and the 2nd, 4th, and 6th Cavalry Divisions, under the Grand Duke of Mecklenburg, in their advance on Chartres. But the II. Army Corps was brought up instead, the 3rd Division, on the 9th, taking up the position hitherto held by the 17th on the right bank of the Seine, the 4th occupying the reserve position in rear of the 3rd. With the exception of a few changes, to be noted later on, this distribution was maintained during the whole period. During the days distinguished by the great sortie of the French Army at the end of November, the German Siege Army comprised 223 battalions, 122 squadrons, 750 guns, and 25 Engineer companies (with the field troops), whilst at the end of October it had numbered 201 battalions, 94 squadrons, 672 guns. The strength was thus increased from 168,687 to about 189,500 Infantry, and from 12,980 to about 17,500 Cavalry.

The following table shows the composition of the Army on the 30th November:—

THIRD ARMY.

II. Army Corps	25 bns.	8 sqdns.	14 batt. (84 guns)	3 Eng. comps.
V. Army Corps	25 bns.	8 sqdns.	14 batt. (84 guns)	3 Eng. comps.
VI. Army Corps	25 bns.	8 sqdns.	14 batt. (84 guns)	3 Eng. comps.
XI. Army Corps	13 bns.	4 sqdns.	8 batt. (48 guns)	1 Eng. comp.
II. Bav. Corps	25 bns.	20 sqdns.	18 batt. (108 guns)	3 Eng. comps.
Guards Landwehr Division	12 bns.	nil	3 batt. (18 guns)	1 Eng. comp.
Total ...	125 bns.	48 sqdns.	71 batt. (426 gns)	14 Eng. coms.

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Guards	29 bns.	32 sqdns.	15 batt. (90 guns)	3 Eng. comps.
IV. Army Corps	25 bns.	8 sqdns.	14 batt. (84 guns)	3 Eng. comps.
XII. Army Corps	29 bns.	24 sqdns.	16 batt. (96 guns)	3 Eng. comps.
Wuerttemberg Field Div.	15 bns.	10 sqdns.	9 batt. (54 guns)	2 Eng. comps.
Total ...	98 bns.	74 sqdns.	54 batt. (324 guns)	11 Eng. guns.

For the defence, the month of November was an extremely important period, for, on the 6th, Trochu considered the organization of his forces to be sufficiently advanced to enable him to proceed to an entire redistribution of them. It was required, in order to carry out the plans of General Ducrot, to withdraw the best organized and trained units for the formation of a strong army fit to take the field, and to reorganize the remainder as the new garrison.

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It goes without saying, that such far-reaching changes in the composition and duties of the various forces could not be effected all at once, and that the necessary changes in quartering and organization connected with them took some time to carry out; and so almost the whole of November had passed before the reorganization had progressed so far that the Governor judged the troops to be fit to carry out the operation for the execution of which it had been inaugurated.

The forces were now divided into three armies, of which the First and Third were intended to form the garrison, whilst to the Second was allotted the difficult task of carrying on operations in the field. Trochu only thought it necessary to hurry on the formation of the latter as much as possible; that of the First and Third was never finally completed.

The First Army, under General Thomas, was intended to act as a reserve to the Second. It consisted of 226 *Bataillons-de-marche* of the National Guard, of 500 men each, and had therefore a strength of 133,000. The *Bataillons-de-marche* were gradually organized, some being united to form regiments. In certain cases they were used to reinforce other divisions or corps, but were never formed into larger units.

The Second Army, under General Ducrot, consisted of three corps, each of three divisions.

I. Corps, General Blanchard.
- I. Division, General de Malroy, 2 brigades and 3 batteries.
  - I. Brigade, General Martenot, 8 bns. Gardes Mobiles.
  - II. Brigade, General Paturel, 5 Line bns. (Nos. 121 and 122)
- II. Division, General de Maud'huy, 2 brigades and 3 batteries.
  - I. Brigade, General Valentin, 4 bns. Garde Mobile and 5 Line battalions (Nos. 109 and 110).
  - II. Brigade, General Blaise, 6 Line bns. (Nos. 111 and 112).
- III. Division, General Faron, 2 brigades and 3 batteries.
  - I. Brigade, Colonel Comte, 3 bns. Gardes Mobiles, 6 Line bns. (Nos. 113 and 114).
  - II. Brigade, General de la Mariouse, 6 Line bns. (Nos. 35 and 42).
- Reserve Artillery, 6 batteries.
- Total, 15 bns. Gardes Mobiles, 30 Line bns., 15 batteries.

II. Corps, General Renault:
- I. Division, General Susbielle, 2 brigades and 3 batteries.
  - I. Brigade, General de la Charriere, 6 Line bns. (Nos. 115 and 116).
  - II. Brigade, General Lecomte, 6 Line bns. (Nos. 117 and 118).
- II. Division, General Berthaut, 2 brigades and 3 batteries.
  - I. Brigade, General Bocher, 6 Line bns. (Nos. 119 and 120).
  - II. Brigade, Colonel Boutier, 8 bns. Gardes Mobiles
- III. Division, General de Maussion, 2 brigades and 3 batteries.
  - I. Brigade, General Courty, 6 Line bns. (Nos. 123 and 124).

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II. Brigade, General Avril d'Enclos, 6 Line bns. (Nos. 125 and 126).
Reserve Artillery, 5 batteries.
Total, 8 bns. Gardes Mobiles, 30 Line bns., 14 batteries.

III. Corps, General d'Exea:
I. Division, General de Bellemare, 2 brigades and 3 batteries.
I. Brigade, Colonel Fournes, 6 Line bns. (Nos. 136 and Zouaves).
II. Brigade, Colonel Colonieu, 7 bns. Gardes Mobiles.
II. Division, General Mattat, 2 brigades and 3 batteries.
I. Brigade, Colonel Bonnet, 4 bns. Gardes Mobiles, 6 Line bns. (Nos. 105 and 106).
II. Brigade, General Dauel, 6 Line bns. (Nos. 107 and 108).
Cavalry Division, General de Champeron.
I. Brigade, General de Gerbrois, 8 squadrons.
II. Brigade, General Cousin, 12 squadrons.
Reserve Artillery, 6 batteries.
Total, 11 bns. Gardes Mobiles, 18 Line bns., 20 squadrons, 12 batteries.

General Artillery Reserve, 10 batteries.

Total of Second Army, 112 bns., 20 squadrons, 306 guns, with 2841 officers, 98,222 men (exclusive of Artillery).

The Third Army, under General Vinoy (originally under Trochu in person), consisted of 6 Infantry divisions and 1 Cavalry division. The former consisted each of 2 brigades, and, except the 1st and 6th, were formed almost entirely of Gardes Mobiles; in the 5th division was 1 Line regiment, No. 137; they were commanded, No. 1 by General Soumain, No. 2 by General de Liniers, No. 3 by General de Beaufort d'Hautpont, No. 4 by General Correard, No. 5 by General d'Hugues, No. 6 by Rear-Admiral Pothuau.

The 1st Division consisted of the Guards and Foot Gendarmes, the Forest and Customs Officials, and the Depots of the 29th and 59th Line regiments. The 6th consisted of the 128th Line regiment, the Marine Infantry, and Marine Fusilier battalions.

The Cavalry Division, under General Bertin de Vaux (1st, Bde.-General de Bernis, 2nd Bde.-Lt.-Colonel Blondel) consisted of 4 Cavalry regiments and the mounted Guards.

The Army consisted of 66 or 67 battalions and 16 squadrons, and numbered 1,867 officers and 70,468 men.[1] It was destined to form the garrisons of the different sections of the line of forts, and so only the 1st and Cavalry Divisions were suitably organized for operations in the field, whilst the 2nd and 3rd Divisions were told off to the peninsula of Gennevilliers, the 4th and 6th to the Southern section

[1] The numbers of the Second and Third Armies based on Vinoy's statements represent the strength on the day of capitulation and should therefore be considerably increased to give that available in the beginning of December. The author of the "Histoire critique" does make the Second Army over 140,000, the Third, however, only 50,000.

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from Issy to Ivry, the 5th to the section from Charenton to Nogent. In this way the sections that had hitherto had to rely on the general reserve for their garrisons, were provided with permanent ones, whilst those of the North and East fronts, under Admiral de la Ronciere le Noury, and General Saisset, were retained. The former succeeded General Bellemare in the command of the now so-called "Army Corps of St. Denis," which was divided into three brigades of seven or eight battalions each, and reached a strength of about 27,000 men. The units enumerated by Vinoy, amounting to some 13,000 men, which were not contained in the formations dealt with up to the present, probably formed part of the section garrison of the plateau of Montreuil, under General Saisset.

It may therefore be assumed that, after the reorganization of the defensive forces (so far as it had become effective by the end of November) an army of at least 112,000 men and 306 field guns was available for offensive operations on a large scale. This includes officers, and allows a minimum of losses up to the time of the capitulation. The troops of the garrison available for operations on the ground in front of the forts (not counting the garrisons of the forts and the Artillery) amounted to about 115,000 men, and both these armies could be supported by a reserve of 133,000 men. This gives a grand total of 360,000 men.

No units of Field Artillery were definitely allotted to the Third Army or to the Army Corps of St. Denis. This may have been because both Field and Fortress Artillery were detailed to them as required from the troops established in front of the forts. Whenever these divisions assumed the offensive, they certainly never were short of artillery, for private manufacturers had taken care to supply a sufficient number of the new 7-pounder field guns.

The strength of the garrisons of the forts and the enceinte—not included in the above figures—and that of the reserves available for the defence of the latter, cannot be exactly determined. Besides the garrisons of the forts,[1] there were also Corps of Volunteers and half the National Guards.[2] An accurate calculation of the strength of these forces would not be of much value, as their employment in offensive operations was out of the question; since, furthermore, an assault of the works was beyond the bounds of possibility, they were only of value in so far as the works took part in the struggle for the ground in front—*i.e*, in so far as they constituted a force of Artillery mounted in a storm-proof position. The numbers available beyond this necessary minimum were therefore of no account.

Although the time and strength of the French commanders was so greatly taken up with the reorganization that during the month of November no extensive operations could be undertaken, the consciousness of their increasing powers caused the section garrisons to become

[1] In accordance with Vinoy the German Official account puts them down at 115,000 including the troops under de la Roncière and Saisset. Deducting these Section Garrisons of 27,000 and 13,000 men respectively, we get 75,000 for the garrisons of the forts.

[2] At the end of November had probably not got 133,000 men in properly organized battalions; but armed men continued to join without interruption, and if the process of organization could have kept pace with the enrolment, two armies of 133,000 men could have been formed.

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more active, and to pave the way for future operations, by working their way to the front step by step, and by all other means in their power. The idea of gaining ground and of pushing forward entrenchments towards the enemy, who ventured no step beyond his position, steadily increased in favour, and General Tripier's example was more and more generally followed all round the fortress.

Maud'huy's division, which retained its position at Villejuif after the reorganization, began by making a new Infantry position further to the front, pushing forward its left wing beyond the most Southern extremity of Vitry, and supporting it by strong entrenchments in the valley and on the edge of the plateau, and running a long shelter trench from this point to the fortifications at Cachan. This position between the Seine and the Bièvre had a length of 3¾ miles, approached to within a quarter of a mile of the German lines at L'Hay, and 660 yards at Choisy, and was strengthened by emplacements for light guns and closed redoubts. The latter were originally only intended for the piquets, but were afterwards closed by palisades or gorge parapets, and armed with mitrailleuses. A large redoubt was commenced on the bank of the Seine.

The garrison of the section of Créteil did not watch these proceedings in idleness. The line from Maisons Alfort to Petit Créteil was first utilized to establish powerful batteries (36 guns in all), but later on (by way of preparing for the great sortie on November 30th) a fresh line was constructed 1,100 yards to the South, joining up on one side with the new position of Maud'huy's division, and on the other gradually taking possession of the whole of the village of Créteil. Here, again, powerful batteries, with a total of 46 guns, were established.

Turning now to the West side of the Bièvre, we find considerable activity displayed near Fort Issy, with the object, on the one hand, of continually increasing the strength of the connecting lines to the Seine and the island of Billancourt, and on the other, of gaining ground along the edge of the plateau of Issy, up the valley of Meudon.

As the Infantry positions advanced, heavy batteries were constructed between, and in front of, the forts. Sooner or later a bombardment by the German siege guns was expected to take place, and timely preparations were made to meet it in superior force. Although by the end of November three 16 c/m (6·3″), and forty 15 c/m (5·9″) guns, and nine 22 c/m (8·65″) howitzers were in position in the section between the Upper Seine and Issy, these heavy pieces were not unmasked during the sortie, in order to keep them as a surprise for the hostile siege artillery. For the support of the field troops there were, however, between the Seine and the Bièvre, eighteen 12 c/m (4·7″), twelve field guns, and six mitrailleuses.

On the peninsula of Gennevilliers, the defender no longer confined himself to the position kept in view in August and September, which he had now held without molestation since the middle of October, but advanced to the bank of the Seine, where the dyke formed an excellent Infantry position. Its left was at Petite Colombe, where it rested on the village, and on a four-gun battery, which directly commanded the demolished bridge at Bezons, and as far as a point opposite

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Epinay; it consisted of a number of detached fire-trenches, 30 to 36 paces long. This line was flanked by nine gun-emplacements, projecting from the dyke like caponiers. But in rear there were four heavy guns on the hill of Moulin Gibet, four at La Folie, and four in the redoubt of Charlebourg, to secure the left wing.

After October 28th, Admiral de la Roncière had not only occupied Le Bourget, but Drancy, Bobigny, and Bondy as well. When the counter-attack of the Guards was made on the 30th, Saisset reinforced these villages from the forts on the East fronts, but no assistance was sent to the garrison of Le Bourget. After the loss of the latter, de la Roncière felt himself unable to hold Drancy either, but pushed forward the fortification of Bobigny and Bondy with great energy, and had them connected up by means of trenches, on one side with Aubervilliers, and on the other with the cutting of the Strassburg railway, and supported by batteries. Suddenly, on the 15th, a change was made; the garrisons of the above villages were only left there by day, being withdrawn at night.

Trochu's attention was now directed towards another matter. On the 14th, news was brought by carrier pigeons of the success of the Army of the Loire against the I. Bavarian Corps at Orléans and Coulmiers. Now the relieving army was known to be advancing on Paris; now Gambetta's telegrams urged that it should be met by the garrison; all the conditions had changed in favour of an attempt to break out towards the South, and preparations for this were vigorously taken in hand.

The means of passage which had hitherto been in course of preparation at St. Denis for assisting the advance from the peninsula of Gennevilliers, could be equally well used for crossing the Marne; the most favourable place for this was at Joinville and Nogent, where the river makes a deep bend to the West, from which the German outposts were far too distant to be able to observe the close country right down to the river bank. The whole peninsula is commanded on the one side by the already prepared position at Nogent, on the other, by the peninsula of St. Maur, and the next thing was to advance rapidly on to the latter, and erect gun emplacements to cover the passage. There was a further reason for this step; the partly covered canal of St. Maur, which cuts across the Western end of the peninsula, appeared to afford an excellently covered depot for the bridging materials, which could be taken almost directly from it to the points of passage. So, first of all, a covered Infantry position was commenced along the canal; then, in advance of St. Maur, a large work, which was provided with a powerful Artillery armament, and could command the peninsula of Joinville.

On the North side of Nogent, attention was now directed towards the plateau of Mont Avron, as high as, and immediately in front of, that of Montreuil, and admirably suited for a gun position to command the valley of the Upper Marne. From this point, the Marne bridges, which served to communicate between the XII. Corps and the Wuerttemberg Division, could be reached, and perhaps destroyed. Numerous reconnaissances were undertaken with a view to settling the scheme for the occupation of the plateau.

When all preparations were complete, the great sortie was fixed

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for November 29th. The conduct of the main operations, at the peninsula of Joinville, was, of course, entrusted to General Ducrot, but the obvious course of placing the whole of the Second Army at his disposal was not followed; Maud'huy's Division of Blanchard's Corps was left, under Vinoy, in its position at Villejuif, and Susbielle's Division of Renault's Corps was detached to the peninsula of Créteil, in order to make an attack on Bonneuil. The 3rd Corps (Exéa) was told off to advance on the right bank of the Marne. To start with, therefore, Ducrot only had two divisions of the 1st Corps (Malroy and Faron) and two of the 2nd Corps (Berthaut and Maussion) with which to carry out his task.

The bridging materials were to be towed under the roof of the canal of St. Maur by steam tugs on the afternoon of the 28th, to be brought into Marne in the night, and to be utilized for the construction of seven bridges, three above and two below Joinville, and two near Nogent at the Ile de Beauté. Two more bridges were to be held in readiness to go into position at Bry as soon as that place should be taken, and, last of all, two more crossings were to be provided on the re-entering bend between Bry and Neuilly.

In the meantime, Admiral Saisset was to seize Mont Avron with 3,000 Marine troops on the evening of the 28th, and arm it with guns, covered by the division manning the Montreuil section, under General d'Hugues.

At dawn on the 29th, all the forts and heavy guns that could bear on the peninsula of Joinville, as well as two 16 c/m (6·3″) guns on armoured trucks at Nogent, were to open fire, whilst the Field Artillery was to come into action at Nogent and St. Maur, and the Infantry was to cross the Marne. After about 1½ hours, firing was to cease by signal from Ducrot, and the attacking columns were to assault Bry and Champigny, turn the enemy out, and establish themselves there. The fire of the Artillery was then to be turned on the main position at Noisy, Villiers, Coeuilly, and Chennevilliers, which, when sufficiently shaken, was to be taken by storm also.

At the same time, Susbielle's Division was to assault Mont Mesly, and the section garrisons were to make demonstrations all round the fortress—Vinoy between the Seine and Bièvre; Beaufort and Liniers on the peninsula of Gennevilliers against Malmaison and Buzanval, as well as the island of Marante in the Seine; and de la Roncière, in the afternoon from St. Denis against Epinay, and in the plain against Aubervilliers. For this purpose the garrisons of the sections had been reinforced as much as possible, and Vinoy had been allotted 6,000 Gardes Nationales; but the latter were not to take part in the action, but only to be shown in the background, so as to hold the enemy's forces in that section.

The reorganization of the defensive forces had not remained unknown to the Germans, who recognized its object, and after hearing of the successes of the Army of the Loire, quite expected important measures to be taken at an early date. And after the middle of the month, signs of their proximity became more and more frequent; it was learned that all roads leading to the East were being opened up; several night attacks were made on Choisy le Roi without success; on the night of the 26th-27th, the positions of the Wuerttem-

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burg Division were heavily bombarded by the forts and the works at St. Maur and Créteil. A simultaneous advance of the Army of the Loire to within dangerous proximity was not impossible, and at headquarters it was thought desirable to have a reserve at hand with which to meet it. On November 16th, the II. Corps was completely transferred to the left bank of the Seine, and quartered between Saclay and Longjumeau. Consequently, the Wuerttemberg Division alone had to hold the whole section between the Seine and the Marne. But in order to support it, if necessary, the 48th Infantry Brigade, with two squadrons, two batteries, and one section of Engineers, was moved to the left bank of the Marne at Gournay, and towards the end of the month the 7th Infantry Brigade was moved to Villeneuve St. Georges. In this manner the attack of the garrison was awaited.

Ducrot's enterprise met with bad luck at the start. Saisset succeeded, on the night of the 28th-29th, in getting two 6·3″, two 5·9″, and eighteen 4·7″ guns into position on Mont Avron, besides field guns, and the tugs had brought materials for not less than nine floating bridges to the canal of St. Maur; but an unexpected impediment to their construction was met with in the shape of the ruins of the blown-up bridge of Joinville, which so narrowed the channel that the tugs could not tow the bridge piers through. They had to be taken to pieces and passed through by hand. It was therefore obvious that the five bridges (above Joinville and at Nogent) required before operations could commence could not possibly be finished by daybreak. This necessitated a postponement of the whole undertaking; but General Trochu did not make up his mind to inform the Section Commanders of this fact till 7.30, and consequently the demonstrations intended for the morning of the 29th were made.

Liniers' Division had already made a demonstration against the Seine on the 28th, but without distracting the attention of the besieger from the real point of attack, especially as the news of the capture of Amiens in the North, and the action of Beaune la Rolande in the South, made an attempt to get through to the West seem hardly probable. Early on the 29th, Beaufort advanced towards the position of the V. Corps, but never even became seriously engaged.

Vinoy displayed more energy; at seven o'clock he sent forward Pothuau's Division against the Gare aux bœufs at Choisy, and Maud'huy's Division against L'Hay. The former succeeded in taking the farm buildings, the latter penetrated into the Northern portions of the village and the churchyard. Vinoy thought he had made considerable headway, when, at nine o'clock, he was informed that the operations were postponed, and withdrew his troops.

In the meanwhile, work on the bridges at Joinville and Nogent continued, and by evening the five above the demolished bridge, by the morning of the 30th the two below it, had been finished, and the repair of the one blown up had been begun. On the German side, all this work had been absolutely unnoticed; but from the reports of the occupation of Mont Avron, and of the various demonstrations, it was concluded that the attack would be made on the weakest section, that held by the Wuerttemberg Division. The 24th Division was therefore ordered to cross the Marne with all its forces by midday on the 30th, and to take over the section as far as Champigny, so that

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the Wuerttemberg Division could concentrate its troops for the defence of the section from Champigny to the Seine.

On November 30th the sortie was made, in the manner intended, on the peninsula of Joinville, Malroy's and Faron's Divisions of the 1st Corps, and Berthaut's and Maussion's Divisions of the 2nd Corps being in the first line, whilst the 3rd Corps, of which Bellemare's Division was first of all to make a feint on the right bank towards Ville Evrart, remained in reserve. At the same time, Susbielle's Division advanced between the Seine and the Marne, and a brigade of Admiral de la Roncière's Corps against Drancy and Groslay, where he took up a position in order to hold the Guards' Corps. We may here anticipate events by stating that at 2 p.m., after a heavy bombardment by the guns of Fort La Briche, a floating battery and field artillery, Haurion's brigade assaulted Epinai. Being attacked from the East, and also unexpectedly from the South, the two companies forming the garrison had to abandon the place as far as the mill-stream; but a counter-attack from Enghien, where other troops had in the meantime been got ready, restored the village to the Germans at 4 p.m.

Beaufort's attack on Malmaison was repeated on the 30th, but with no success; whilst the advance of Susbielle's Division brought about a serious engagement.

During the night a bridge had been made at Port de Créteil, and at 3 a.m. Susbielle crossed to the left bank of the Marne, and at 6 he opened fire with the two powerful batteries at Créteil, at the same time as the heavy guns at St. Maur and Charenton. At nine he ceased fire, and advanced with one regiment on the main road against Bonneuil, with the other against Mesly.

The 2nd and 3rd Wuerttemberg Brigades numbered 10 battalions and four batteries; they had in the front line 10 companies (2½ bns.), of which four were in Bonneuil, three in the Ferme de l'Hôpital, the others distributed singly in Choisy, Carrefour Pompadour, Mesly, and Mont Mesly. By 9 a.m. the 2nd Brigade had assembled in rear of this line with four battalions at Sucy, the 3rd at Brevannes with 3½, and the Prussian 7th Brigade at Valenton with six. Mesly and Mont Mesly had to be abandoned, a counter-attack from Ferme de l'Hôpital failed, and the French attacked Bonneuil, surrounding the place from the West. The 2nd Brigade joined in the fight for this village, but was unable to turn the enemy out of the Western portion of it which had already been captured by him. It was only by the fire of the four batteries which came into action near Valenton and Brévannes, that the French battalions, now advancing against Valenton, could be forced to fall back; this took place at 11 a.m.; a counter-attack from this place was made by 3½ Prussian battalions, who got as far as Mesly, and obliged the enemy to abandon Bonneuil also. This started the pursuit, in which the Wuerttemberg Cavalry were able to join, but which was checked at nearly 1.30 p.m. by the renewed fire of the heavy guns.

It was not till about this time that Vinoy's troops came into action on the left bank of the Seine. In the preceding gun fire, gunboats and armoured railway wagons had also joined. But Pothuau's attack on Choisy le Roi, as well as that of Blaise's brigade on Thiais, was defeated by the resistance offered by the Prussian garrisons;

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the gunboats were stopped by two guns which unlimbered on the river bank.

During these subsidiary events on the South, West, and North of the fortress, a severe struggle had developed on the peninsula of Joinville. The passage of the two French Corps began at 6.30 a.m., and was finished by 8.30.—the attack could commence.

At Joinville, the plateau, which generally follows the left bank of the Marne, is about 4,400 yards distant from it; to the East of Champigny it falls suddenly from a height of 275 feet to 130 feet; but on the West of Villiers it slopes from the same height to a narrow ridge nearly 200 feet in height, which follows the North bank, and gradually falls towards it. A deep cut is formed in the plateau by the Lande brook, which runs up from West to East, and divides the portions projecting into the peninsula East of Champigny and South of Brie into two flat knolls of small extent. These two knolls command the peninsula, the valley of the Marne, and that of the Lande; at their feet are situated Champigny and Le Plant. About 1,100 yards East of the edge, a short side valley branches off, on the Eastern edge of which is Coeuilly, whilst Villiers lies exactly opposite its entrance into the main valley, and commands a view of it lengthwise. The two villages are divided by the Lande valley, in which the railway to Langres ascends to the plateau.

By the end of November the following fortifications had been constructed by the Germans. The villages of Noisy, Villiers, Coeuilly, and Chennevières had been utilized as supporting points, and prepared for defence, along their Western edges, the parks and woods of the second and third being included in the defences. In the intervals between them, which measured over 1,400 yards each, no Infantry positions had been prepared, and only one Artillery emplacement had been constructed at the North side of Villiers, a second on the South side of it (at the park wall), and a third in front of the South edge of Coeuilly, each for six guns. To command the peninsula of St. Maur, there was, further, a four-gun battery West of the "Jägerhof," which was used as an intermediate post.

In the outpost line, Le Plant (2,500 yards from Villiers), and Champigny (the Western edge of which is 3,300 yards in front of Coeuilly) had been fortified and connected by means of a traversed shelter trench, which was continued to the railway embankment. The slope facing the Marne of the Northern ridge was swept by a four-gun battery on the road to Villiers, and provided with trenches. At Grand Four à Chaux, sites had been prepared for six guns.

On the morning of November 30th, the 48th Brigade was about to relieve the 1st Wuerttemberg Brigade, the 1st Battalion 107th Regiment was in positon at Champigny and Le Plant; on its right was the 2nd Battalion, with two companies each in Bry and Noisy, the main body of the brigade being at Gournay and Champs. In rear of the Saxon outposts, the Wuerttembergers still occupied Villiers, Coeuilly, "Jägerhof," and Chennevières; their second brigade was at Sucy.

Without waiting for the reserve Artillery to cross, Ducrot advanced against the German position. Maussion's Division turned out the Saxon company in Le Plant, then, turning towards Villiers, it

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ascended the Northern knoll at 10 a.m. near Bry, and forced the two companies there, who were also threatened by the advance of the 3rd French Corps on the other bank, to fall back on Noisy le Grand. At the same time, Berthaut's Division reached Petit Bois de la Lande with its right wing, and Malroy's Division got as far as Grand Four à Chaux. The seizure of Champigny was not effected with so little loss and in so short a time by Faron's Division, as a Wuerttemberg battery had come into action in time on the plateau East of the village (at Belair), successfully maintained itself against two French batteries that unlimbered in the low-lying valley of the Marne, and only retired when the Saxons (three companies) were compelled to evacuate Champigny in the face of superior numbers, and the French ascended the heights.

Having arrived on the plateau, Maussion's Division immediately attempted to seize the park of Villiers, but was repulsed. In accordance with the scheme, Ducrot wanted to make a holding attack until the 3rd Corps should join in the action from the direction of Noisy le Grand. But when, at 11 a.m., he heard that the latter was still on the right bank of the Marne, he did not wish to expose his troops any longer to loss within effective range of the German position, and resumed the attack. This failed completely, mainly owing to the effect of the Artillery which had been brought up in the meantime, and by 11 a.m. occupied the following positions:—One battery South of Noisy, one North and one South of Villiers (the latter was reinforced in time by two others when Berthaut's Division ascended the Lande Valley), and two batteries South of Coeuilly, 36 guns all told, with which the French batteries on the edge of the plateau could not cope, and had to retire to more distant, and therefore less elevated, positions. The Infantry garrison at this time amounted to four companies in Noisy, four North of Villiers, ten in Villiers, nine near and in Coeuilly, and six at "Jägerhof," or 33 companies altogether. Each French brigade was thus opposed by about one German battalion. This force was too weak to pursue the French battalions, which had been repulsed on both wings; the French retired to the edge of the plateau, to hold which Ducrot brought up 18 batteries.

Early in the morning, d'Exéa's Division had advanced through Neuilly-sur-Marne on Ville Evrart and Maison Blanche, driven the outposts back on Pont Part and Le Chenay, and so held the 23rd Division fast on the right bank of the Marne. Not till 1 p.m. did the Commander of the XII. Corps deem it advisable to despatch the 4th Brigade of the Corps Artillery to the left bank, as the French advanced no further. Protected by their batteries which had come into action on the right bank, they had commenced the construction of the bridges between Bry and Neuilly at 10 a.m., and had completed it by noon. After having been delayed to start with by the fighting on the other bank, the Army Corps began to cross over at 2 p.m., and turned towards Bry in order to establish communication with Maussion's Division. This gave the German right time to reinforce the garrison of Noisy (by four battalions by degrees), and the Artillery at Villiers (by three fresh batteries).

Bellemare's Division, reinforced by four more battalions of the 1st Corps, now commenced an attack against Villiers, which was taken

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up by Berthaut and Faron along the railway embankment and against "Jägerhof," but was repulsed at all points, in which at the last-named place reinforcements from the 2nd and 3rd Wuerttemberg Divisions (three battalions) co-operated.

As night fell the firing ceased. Opposite the German outpost line (Belair, Villiers, Noisy), the French were posted from Champigny along the West edge of the plateau of Villiers, as far as the Marne South of Neuilly. Faron's Division held Champigny, Malroy the Limekilns (Four à Chaux), Berthaut continued the line North of the railway, Maussion was in reserve in rear of Le Plant. Of the 3rd Corps, one brigade, with the Artillery, was on the right bank of the Marne, and Neuilly was held by Gardes Mobiles.

In accordance with orders from the Royal Headquarters, the Germans were reinforced at 9 a.m. on December 1st by the arrival of the 7th and 21st Brigades at Sucy, and of the 3rd Division, with the Corps Artillery, in the position between Boisy and Sucy, in the afternoon. Those parts of the XII. Corps which had already arrived to reinforce the Wuerttemberg Division on November 30th, namely, the 24th Division, four battalions of the 23rd, and a brigade of the Corps Artillery, had remained on the scene of action. But although, according to the German Official Account, General Ducrot considered the sortie to have failed, and only refrained from withdrawing his army for fear of riots, he brought up as reinforcements Susbielle's Division, a few battalions of Gardes Mobiles of the Third Army, and as a reserve 33 battalions of Gardes Nationales.

In spite of this increase of his forces, Ducrot did not resume the attack on December 1st, but employed the day in fortifying the captured position as strongly as possible, even putting on 1,200 civilian labourers, who were already at work on the night of November 30th. The works executed in this way show extraordinary diligence and great skill. A continuous Infantry position, with several gun emplacements, was constructed in the foremost outpost line; Bry and Champigny were prepared for defence, and gun emplacements made between them; at the same time work was proceeding on an extensive position on the peninsula of St. Maur, forming a connecting link between the works on the left bank, at Champigny, and Créteil; and on Mont Avron and in advance of Fort Nogent a whole system of powerful works was created. The bridge-heads on the peninsula of Joinville, which were disposed in three lines one in front of the other, and covered the points of crossing (they are marked on the map), were commenced on December 2nd and 3rd.

Immediately after the fighting on November 30th, the Germans, anticipating its renewal the following day, set to work to strengthen their position, where, above all, a better fortification of the intervals was needed. As no attack took place on December 1st, the whole of that day could be devoted to the work. Being now sufficiently strong, owing to the arrival of the Prussian troops, the Crown Prince of Saxony proposed to assume the offensive in the afternoon, but this did not actually take place till December 2nd.

For this purpose the Saxon troops on the left bank assembled early in the morning South-east of Noisy le Grand, the 1st Wuerttemberg Brigade at Villiers and Belair, the 7th Prussian Brigade at

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"Jägerhof." At 7 a.m. the Saxon battalions advanced by Noisy and Villiers against Bry-sur-Marne, and penetrated into the village, but were unable to make any further progress, as the two brigades forming the garrison were successfully supported by Artillery fire from Mont Avron and Forts Rosny and Nogent. Simultaneously, the Wuerttemberg Brigade attacked Champigny and the Bois de la Lande, but was also unable to achieve any decided success, as it was opposed at this point by the divisions of Faron and Malroy.

But in the meantime, Ducrot had brought up Susbielle's and Bellemare's divisions, and at 9 a.m. deployed a large force of Artillery, under cover of which he sent forward the divisions of Faron and Malroy. They were met by the battalions of the 7th Prussian Brigade, which had by this time come into action, on the plateau; 11 batteries of the 2nd Corps gradually came into action, in line with the six Wuerttemberg batteries, and the 6th Brigade, which had come up in the meantime, also sent reinforcements. By mid-day, these troops succeeded in advancing as far as the road to Bry, and this part of the field remained in possession of the Germans, as well as the corresponding portion of Champigny.

Whilst in this manner the situation South of the Lande had become favourable, in the Northern section the Saxons had, after a long and sanguinary struggle, been forced to abandon Bry, and to retire to Villiers. Just then Bellemare's and Susbielle's divisions arrived on the left bank of the Marne; the former relieved the two brigades fighting in Bry, the latter deployed a large force of Artillery against Villiers, and so a fresh attack on this place appeared to be imminent. But four batteries of the 2nd Corps boldly advanced on to the hill East of Champigny, thus taking the hostile guns in flank, and compelling them to retire, and an attack made by the French Infantry at 3 p.m. was not strong enough to achieve success. Darkness put an end to the fighting on December 2nd.

On this day, Ducrot had been informed of the advance of the Army of the Loire on Fontainebleau, and had therefore determined to hold fast the German Army before Paris by remaining on the left bank of the Marne. He ordered supplies to be brought up, the teams of the batteries to be completed, ammunition to be replenished, and the bridge-heads to be strengthened. At dawn on December 3rd he furiously attacked the German position all along the line, but after the repulse of this stroke he did not continue the action.

For the 4th, the Crown Prince of Saxony had also sent up the 23rd Division, and the Commander of the Third Army had supplied another brigade of the VI. Corps, in order to force the French to abandon the left bank of the Marne. But Ducrot may have feared that his exhausted troops would not be able to withstand an attack repeated with even larger forces; a severe defeat—with the Marne behind him—was all he could expect. He had already commenced his retirement on the afternoon of the 3rd, and, under cover of a dense fog, had made such progress that, by the evening, the whole of the Second Army had regained the right bank, with the exception of Mariouse's brigade, which was left behind to guard the bridges. Another bloody and important act of the great drama had thus drawn to a close; it cost the German troops nearly 6,200 men, but the

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French losses amounted to over 12,000. As at Sedan and Metz, on September 1st, the German arms had been victorious over the fortress and over the field army, on which the former had set its hope. On the day on which Ducrot withdrew his army from the peninsula of Joinville, General d'Aurelle found himself compelled to abandon the right bank of the Loire.

The German troops that had been brought up as reinforcements returned to their units, and to the sections to which they had previously been told off; but from henceforth the II. Corps held the position between Ormesson and the Seine with one division, keeping the other in reserve. The Wuerttemberg Division, therefore, retained the portion between Ormesson and the Marne, and immediately commenced a new system of fortifications, both on the high ground as well as in the outpost line from Champigny to Le Plant. For this purpose, in addition to its own two, seven other Engineer companies were lent to it from December 6th to the 14th. The new fortifications were of a totally different type to the old, which it is necessary briefly to explain.

The outpost line, as before, just touched the Western edges of Champigny and Le Plant, but was strengthened by obstacles; in rear of it was constructed the line shown on the map from the blown-up bridge over the Marne near Champigny, by the Limekilns, to Bry, which formed the front line, or fighting position proper. On the knoll East of Champigny, three batteries of strong profile, to take 20 guns in all, and provided with cover for the limbers, were built. Then the second fighting position, or, rather, supporting position, which continued to follow the general line of the villages, was prepared for the reception of a very powerful force of Artillery. The emplacements between Chennevieres and the Marne, which followed and commanded the slopes of the plateau and swept the hollows at Coeuilly, were prepared to take no less than 126 guns, including the 22 with which they had originally been armed. Besides obstacles and Infantry trenches between the villages, a few large infantry redoubts were also deemed necessary, and one was placed on each of the spurs of the plateau North and South of the Lande brook, being sited so far to the rear that the edge of the plateau was within the most effective range of the rifle.

General Ducrot retained possession of the Western part of the peninsula of Joinville after December 4th, and had the bridge-heads completed in the most thorough manner with bomb-proof shelters, batteries, and obstacles. Moreover, as the most important result of the undertaking, Mont Avron remained in possession of the defence, and its summit was crowned with six 6·3″ and numerous 6″ and field guns, 74 in all, and surrounded with Infantry entrenchments on all sides. This strong Artillery position, situated some two miles in advance of the line of forts, was bound, as time went on, to interfere to an ever-increasing extent with the investment, since it directly threatened the heights of Raincy, and so far commanded the valley of the Marne that the employment of the nearer bridges was impossible.

But in the actions from November 30th to December 4th, General Ducrot's army had suffered so severely that a change in its organiza-

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tion appeared desirable, in order that its units might be fit for fighting again as soon as possible. The 1st Corps was broken up, and the 2nd and 3rd were re-numbered 1 and 2. One division of the 1st was handed over to the 3rd Corps, and the remainder formed a reserve for the Second Army.[1]

General Ducrot did not yet see the necessity of abandoning his attempt to break out; he now wished to try again on the North-East side. In order to prepare and support the undertaking, Trochu reinforced the armament of all the forts and provisional works that could bear on the ground, chiefly by means of the 7·5″ and 6·3″ Naval guns. On the forts from St. Denis to Rosny, three 7·5″ and thirty-four 6·3″ were mounted, and, in addition, four railway trucks armed with 6·3″, and half a movable battery of three such guns were held in readiness for use, making a total of 44 guns that could reach the German position on the Morée brook. Furthermore, a portion of the 5·9″, and even the 4·7″, could be employed at the nearer objectives (Dugny and Le Bourget), namely, eleven 5·9″ and eight 4·7″. To the latter must be added fourteen 4·7″ at Corneuve, and a battery of eight 32 c/m. (12·6″) mortars which had been constructed there. All these guns made up the respectable total of 55 heavy and 22 medium guns, and eight heavy mortars.

Trochu having announced his intentions at a council of war held on December 16th, Admiral Saisset was directed to make preparations at Bondy for energetically supporting the operation. He therefore placed in position at that point two 6·3″, nine 5·9″, twelve 4·7″ and sixteen smaller guns, as well as the half-battery already alluded to. In the meantime, the Engineers made eleven new bridges over the Ourcq Canal, between the *enceinte* and Bondy, so that there were now—including the permanent bridges—17 available on a line of 3¾ miles.

The scheme was carried out on December 21st. Trochu arranged for Admiral de la Roncière to attack Le Bourget with the Corps of St. Denis, and for General Ducrot, on the right, to attack Le Blanc Mesnil and Aulnay les Bondy with the Second Army, after the fall of Le Bourget. The attention of the Germans was to be distracted by attacks at Stains, Pierrefitte, and Epinai, and by a heavy Artillery fire from Mont Valérien, whilst in the valley of the Marne, General Vinoy was to advance against Ville Evrart and Maison Blanche, in order to destroy the bridge at Gournay if possible.

But as the preparations had not passed unnoticed, and the concentration of large masses of troops had been observed at Noisy le Sec on the 20th, the German Headquarters had been able to take steps. The Guards Corps had been made available as far as possible, and the 7th Infantry Division held itself in readiness to relieve their outposts at Pierrefitte and Stains. The 2nd Division of the Guards held the passages of the Morée, the available portion of the 1st Division was assembled at Gonesse with five batteries of the Corps Artillery. At Sèvran were six battalions and six batteries of the XII. Corps. In order to assist the Wuerttembergers if necessary, the 4th Infantry Division and the Corps Artillery of the II. Corps marched

[1] It seems superfluous to go into the simultaneous re-organization of the 3rd Army, as its bearing on the subsequent events is of no importance.

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to Malnoue. The immediately threatened village of Le Bourget was held by the 1st Battalion "Koenigin Elizabeth" Regiment and the 1st Company of the Guards Rifle Battalion. The 1st and 4th Companies "Elizabeth" manned the West and East edges respectively, the 2nd and 3rd were in reserve, the former at the Northern exits, the latter in the middle of the village at the glass-works. The Rifles held the barricades on the roads to Aubervilliers and Drancy.

After a heavy Artillery fire lasting half an hour, the French assaulted Le Bourget from the South and West at 8.15 a.m. on December 21st. The Western column—five battalions and one battery—did not succeed in getting in in front, but outflanking the position on the North, they drove back the 2nd Company from house to house till they were checked at the glass-works. But at this point the 3rd and 4th Companies stood firm against the South column—seven battalions—also, so that the French reserve column of five battalions was also directed against it. There is no doubt that the defenders would soon have been crushed by the superior numbers of the French but for the arrival of a company from Le Blanc Mesnil at 11 a.m. "With considerable difficulty a report was taken as far as Pont Iblon from Captain v. Altrock, commanding at Le Bourget, and about an hour after (the events just described) the 1st Battalion 'Kaiser Franz' Regiment and three companies 'Koenigin Elizabeth Grenadiers' arrived from there" (Pont Iblon). With the assistance of these seven companies, and of two Rifle companies that arrived later, the enemy was driven out of the village, which was then garrisoned with 15 companies—"as originally intended."

This decided the day. The fortress guns smothered the place with a hail of shells, and the Second Army, after waiting in vain for the pre-arranged signal—the capture of Le Bourget—advanced beyond Bondy and Drancy, and brought its Artillery into action. But now the Prussian Artillery accepted the challenge. First three, then five, batteries came into action, and as the long range prevented them from producing sufficient effect, they advanced—under the fire of the fortress guns—to a position North-east of Le Bourget, and "successfully engaged the hostile Artillery." Towards mid-day the French troops retired.

Of the demonstrations, only that made by General Vinoy is worth mentioning. He had sent four battalions of Blaise's brigade through Neuilly against Ville Evrart, and a column of seven battalions, under Salmon, against Maison Blanche, whilst d'Argentolle's brigade occupied Neuilly. After a heavy bombardment, the Saxon piquets were easily driven out of the farms. After this there was a duel between the guns on Mont Avron and three of Vinoy's field batteries on the one side, and some Wuerttemberg batteries on the other, the latter being on the left bank, and repeatedly moving from one prepared emplacement to another. In this action the garrison of Mont Avron, according to French reports, suffered considerably.

At dusk, Salmon's column was withdrawn, and the four battalions left in Ville Evrart were, at 7 p.m., completely surprised by several battalions of the 24th Division, and lost 600 prisoners. The fight went on till midnight, when it was broken off by the Saxons. On the morning of the 22nd, the French again advanced in several

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strong detachments, but were met by the Wuerttemberg batteries and twelve Prussian 4·7″, which had just been brought into action "in an accelerated manner," with so heavy a fire that they disappeared again as fast as they could.

As we see, at this point the first batteries came into action which had been built during the preceding days, and armed for the purpose of engaging Mont Avron. With this step, which led to the bombardment of the French Artillery position on December 28th, the besieger for the first time abandoned the purely passive rôle which he had elected to observe for exactly the first hundred days of the investment. He began the offensive operations which, together with the consequences of the investment, later on led to the capitulation, and will have to be dealt with at a later period.

Here we have only to add a few remarks on the reasons which prevented the army of investment from November 1 till far into December from employing its heavy guns, in spite of the fact that as early as the end of October, 235 of them were standing ready in the park at Villacoublay.

Quite extraordinary exertions were required in order to bring up the ammuniton for these guns. It is true that on November 23 immediate communication with Germany had been established at Chelles, but most of the ammunition had been unloaded at Nanteuil, and then had to be transported by road for a great distance. To start with, the first instalment of 500 shell and 50 shrapnel per rifled gun had to be brought up, which, not counting the (S.B.) shell-guns and the powder, made up a total weight of 2,700 tons for projectiles alone; further, whilst the guns were in action, the arrival of the second instalment, of the same amount as the first, had to be assured, and so a simple sum in arithmetic would show how many vehicles would be needed for each journey, allowing a period of eight days in which to do it. These calculations were actually made by Colonel Rieff, who was charged with the conduct of the attack, and the required number was frequently stated in his reports.

By the end of October, by dint of utilizing to the utmost possible extent the transport of the troops and supply columns, there had been brought up to Villacoublay for each long 5·9″ gun 115 rounds, for each short 5·9″ gun 200, for each 4·7″ gun 25, and for each 3·5″ gun 120 rounds, but 2,350 tons were still wanting to complete the first instalment, and Colonel Rieff reported on November 7th that 1,000 vehicles would take about 24 days to transport this quantity. If, therefore, fire was to be opened on December 1, 1,400 vehicles would be needed to ensure the supply from Nanteuil to Villacoublay, and 350 to distribute the ammunition to the batteries, or 1,750 in all. It will be seen that this assumes a load of 15 cwt. per vehicle.

The Commander-in-Chief of the Third Army, who had been charged with transport of the siege stores, still believed, in spite of the unfortunate experiences of October, that these carts and horses could be got together by impressment, and troops were repeatedly ordered to supply transport. The success of these exertions may best be estimated from the fact that on November 30 there had arrived at Villacoublay 171 rounds per long 5·9″, 250 per short 5·9″, 107 per 4·7″, 185 per 3·5″, 89 per 8″ mortar, and 16 per S.B. howitzer.

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In the whole month 275 tons had been transported, and at Nanteuil there were still 2,075 tons, and the second instalment of 2,700 tons, together 4,775 tons, and nearly eight months would be needed to bring up only the first instalment if the same rate were maintained.

King William could not fail to discover that the date fixed at the end of November for the opening of fire, namely, the early days of December, could not possibly be adhered to. There is no need to allude here to the persons who drew his attention to the fact. He commanded Generals v. Hindersin and v. Kleist to report to him in person on November 25th, and himself wrote to the War Minister and to the Chief of the General Staff of the Army, ordering them to submit a report by December 1 at the latest, stating the means to be adopted for bringing up the required ammunition in the shortest possible time. His Majesty added that since the reconstruction of the railway communication as far as Lagny, means must be found for removing the difficulties in the way.

Under this powerful pressure, means were discovered pretty quickly. The Commander-in-Chief of the Third Army was in a position to report that a contractor in Germany had offered to supply 900 to 1,000 horsed vehicles in the shortest time at 18 shillings a day each. Based upon this statement, it was possible to order the mobilization of 24 ammunition columns, organized on military lines, of 40 four-horse wagons each, which arrived by train soon afterwards. In addition to this, in consequence of the victories gained over the Army of the Loire on December 3rd and 4th, there was no risk in making use of a portion of the ammunition columns of the Third Army for the transport of the siege ammunition, and so, by the first days of the new year, the whole of the first instalment had been got up, and the uninterrupted supply of the remainder was assured.

Since the capitulation of La Fère on November 27th, and the removal of the last obstacles on the line Soissons-Sévran on November 16th, the transport of siege stores for the attack on the East fronts had presented no difficulties. The ten 5·9″ and sixteen 4·7″ employed in the siege of that fortress, and thirty 5·9″ and twenty 4·7″ sent from Germany, could be brought up, with their stores and equipment, and placed in position without any delay. It was the first twelve of these guns which joined in the action of December 22, with such effect, and, contrary to the original intention expressed in the scheme of attack, it was owing to the offensive action initiated by the defence, on the East front that the first part of the Artillery attack was to be enacted, at a time when, in spite of months of effort, this could not be accomplished on the South Front.

DISCUSSION.

The period of anxious waiting for heavy artillery, extending over the months of November and December, affords the most striking proof of its importance to the investing army, and of the necessity of making adequate preparations for its transport before the siege operations are commenced.

Fear of the fortress guns may compel the line of investment to be kept from 3 to 4½ miles from the line of forts, or a bold attack, fol-

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lowed by stubborn resistance,may enable it to be established within 1½ miles of them, or less, but the besieger's troops and works are always exposed to the effect of the defender's projectiles, which will always remain the same. For in the former case the defender is allowed room and opportunity to spread himself out, and pushes his artillery position closer up to the besieger, who has omitted to wrest the foreground from him, and to cramp and fetter him by a resolute advance.

It is therefore not right to keep the line of investment at a great distance from the works until such time as the heavy guns have arrived, quite apart from the fact that at such ranges their fire will be ineffective, and that this can only be remedied by a closer approach. And the greatest error of all is to settle down in an investing position with the idea of awaiting events, and extending it indefinitely just as one's fancy dictates, for the passive attitude of the besieger permits the defender, by his decisions, to make the former dependent upon him, to reverse the position, to harass him in his lines by all the means at his disposal, and to completely wrest the initiative from his grasp. To such an extent may this be the case, that the besieger may be forced to change his plans and abandon the front for the attack of which he has, with immense exertions, brought up the necessary stores. Of this, the example of Paris affords convincing proof.

By extending the defensive position to Mont Avron, which threatened both groups of the German forces, and divided them from each other, Trochu forced them to take a step which had never been contemplated, namely, to make an attack on the East front. It was extremely fortunate that the railway lines and siege stores could be made available, and that the latter could be got up in time for this operation. Otherwise, the only alternative would have been to take some of the guns from Villacoublay back to Lagny. And if by that time the ammunition had already arrived on the South side—which, after all, was the great object aimed at—it also would have had to be taken back, not to mention the numerous stores required in the parks, which it would have been essential to shift from the South to the East front.

It is therefore correct to approach as close as possible to the decisive fronts, having previously taken the indispensable step of arranging for heavy guns—in the first place, those of the field army, followed as soon as possible by those of the siege park—to be at hand at the earliest possible moment to support the field army in its difficult position in face of the fortress guns, and to make the fullest use of the advantages it has gained for them. In this way alone will the besieger be able to derive full value from the weight of his first attack, to retain the initiative, to force his opponent to conform to his decisions, and to make the measures adopted by the defence depend upon his own. In siege, as in field operations, this is the fundamental problem, and the method of solving it is the same in both cases.

At the same time, in the former, the Infantry cannot be spared the necessity of having to hold out for a time in the positions it has won under the unremitting fire of the fortress guns. The most press-

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ing need will then be that of providing cover against this fire, and means of defence against the assaults of the garrison, and that for this the strength and training of the Infantry is not sufficient is perfectly obvious; it is also clearly brought out by the events that took place before Paris. For these purposes technical skill is required, and as the field units of the Engineers are fully occupied on other work, particularly the construction of roads and bridges, and as, moreover, their numbers are insufficient for these works, which have to be executed in a minimum of time, it is necessary to allot units of Fortress Engineers to the besieging force before the commencement of the operations. This period, however, does not begin with the arrival of the siege artillery, but with the first opening movements against the fortress, from the moment when they conform to a general plan—as must be assumed for future operations—and are directed towards the reduction of the fortress by all available means.

Next to the technical troops, the Field Artillery is called upon to assist and support the Infantry in every possible way. To whatever degree of perfection it may have attained, the fortress guns and works will have reached a corresponding stage, and therefore the Field Artillery is not called upon, nor is it able, to engage in a duel with the guns and works of the fortress; but in critical situations it can afford considerable relief to the Infantry, and it should sacrifice itself in cases when great and difficult tasks are to be fulfilled.

In field operations, the Field Artillery does not hesitate to risk its existence in order to help attain the common object, and in fortress operations it cannot be right to keep it back in a safe place, and leave the field of battle to the Infantry alone. At Paris, we find the Field Artillery employed in a variety of ways. In the actions that took place in the foremost fighting line it was often absent, to the great detriment of the Infantry, for wherever it did join in the fight it generally proved effective, as, for instance, at Bagneux, when it was greatly harassed by the guns of the fortress, but its action rendered possible the attack on the village held by the enemy. On November 30th, on the contrary, it was absent from the fighting line, but when it joined in later on its effect was immediately apparent, although the force employed was far too small. There is no need to point out the important part it played, especially in the fighting around Villiers. That it may even come into action and be effective under the fire of fortress guns is shown, among other instances, by the batteries of the Guards at Le Bourget, and of the Wuerttemberger at Ville Evrart.

In spite of its having achieved these successes against the hostile works on the few occasions when it was employed, the Field Artillery was generally held back with great care; it remained silent so long as it was not routed out of its hiding-places by sorties, and thereby forced to take part in the fighting, and, as a matter of principle, it was not employed against the French trenches and batteries under construction, which were continually pushed further and further to the front, and enabled the defender to bring gun fire to bear on the line

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of investment at constantly shortening ranges. It remained silent at times when it is impossible to understand how works could have been carried on, and heavy guns mounted, under its fire. It remained silent in order that it might not be exposed to the fire of the fortress guns, although the latter became daily more dangerous to the Infantry. This anxious saving of the artillery is not right. What did the loss of a few guns matter if it meant checking the enemy and bringing relief to the Infantry?

A most distinguished officer, General v. Blume, recently made detailed statements as to the reasons which led to so unexampled a delay in the commencement of the artillery attack. Whatever influences may have been brought to bear—and it is not my intention to investigate them—General v. Blume's narrative discloses the remarkable fact that even very highly-placed officers by no means understood questions connected with siege operations. In the early stages it was evidently thought to be quite unavoidable and natural, and one of the usual incidents of a siege, to be left for weeks on end in front of a fortress without weapons of equal power to those of the latter. But instead of demanding them, and getting them brought up in any case, they began to discuss whether the fortress was to be bombarded, or attacked by regular siege, or whether it would be possible to subdue it by starvation. And, according to many of the Generals, it depended on the answers to these questions whether guns would be needed at all, and, if so, at what time. And since, as General v. Blumenthal says in his letter of November 21st, "it could not be doubtful that Paris would be forced by hunger to capitulate at the very latest by the end of the year," heavy guns were not wanted. One cannot but agree with this General's opinion that: "If half measures can never in any conditions of life lead to the desired result, this is most particularly the case in military affairs, where it is necessary to stake all in order to achieve great results, and where a halt half-way can only lead to disaster, but brings no advantage." But with these words he severely, though involuntarily, condemns the attack of Paris, for it cannot be regarded as anything but a half measure to begin the combat with inferior weapons, and not to put forth the utmost effort of which one is capable. As admitted by General v. Blume, it was the fault of no one but the Headquarters of the Third Army that the transport of the ammunition was neglected. He quite rightly points out that the difficult circumstances necessitated constant pressure from above, and continual supervision in order to get the King's orders promptly executed. But the pressure was not applied; and why? Because the matter was not thought sufficiently important not to be neglected over the consideration of trifling details. Sufficient understanding of siege operations was wanting for the complete change in the situation to be realized, which the assistance of the heavy guns was bound to bring about. Only a few men, among them the War Minister, were able to appreciate their full value. Others were completely surprised at the sudden alteration in all the circumstances of the siege which resulted from the arrival of the siege batteries.

The enormous superiority which his exceptionally powerful and effective heavy artillery conferred upon him was utilized by the de-

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fender in a skilful manner that was at times well calculated to ensure success. By means of it, the troops that were ready in September were not only enabled to hold the line of forts during the months of October and November, but also to extend it and to render secure the possession of the important advanced positions which they had regained, thus gaining time for the organization of additional forces, and the preparation of more ambitious schemes. It further provided the means of initiating these operations, and creating favourable conditions for their execution. Thus a very prominent part in rendering possible the offensive conduct of the defence was played by the heavy artillery.

With the extensive means at his disposal, Trochu was bound to conduct the defence on big lines, and, like Bazaine at Metz, he had two courses open to him. He might employ the large forces which the besieger had given him time to organize either to break through the line of investment, or to force him to a very considerable extension of it. The former alternative was Ducrot's plan; the latter is brought forward by Viollet-le-Duc in his book, and was probably also submitted to Trochu during the siege.

The strategical situation seemed to favour the scheme of breaking out with a powerful army, fit to undertake field operations, more than it did in the case of Bazaine. Encircling Paris on the West, at a distance of 50 to 60 miles, the French troops were assembling in the provinces, and, as early as October, attracted the notice of the German Cavalry divisions, to whom the duty of covering the rear of the investing army was mainly entrusted. But, whilst Ducrot thought that the junction with the relieving forces could be easiest effected in the direction of Rouen, early in November the conditions on the South side became more favourable. At Coulmiers, on the 9th, Aurelle de Paladines, with more than threefold superiority, forced the 1st Bavarian Corps to fall back on Toury (47 miles from the forts of Paris), afterward re-occupying Orléans, and then proceeded to collect an army of 200,000 men, under cover of the Forest of Orléans. To start with, he had four corps formed in October, the 15th, 16th, 17th, and 18th. In two days he could reach Fontainebleau, and the army of Paris had no more than 31 miles to cover to reach that place. For the time being no more than four German divisions could oppose Aurelle; his success could therefore be confidently counted on, and so Trochu gave up his original plan, and decided on breaking out to the South-east. Since the news of Coulmiers only reached him on November 14th, it may be assumed that he knew nothing of the movements of the Second Army, which was just about to place itself between Paris and Orléans, and of which the IX. Corps had already reached Fontainebleau on the 15th. It is well known that a more rapid and better arranged advance of the great French army from Orléans, timed to anticipate the arrival of the X. Prussian Corps, would have had far greater chances of success.

The tactical situation was also favourable to Trochu. Owing to the possibility of a successful advance on the part of the Army of the Loire, the II. Prussian Corps had been detailed to act as a reserve, and so the section attacked was only held by the Wuerttemberg division, amounting to about 14,400 Infantry, 1,640 Cavalry, and 54 guns

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(according to the states of October 31st). To these numbers may be added the two brigades of the XII. and VI. Corps, which were held in readiness to assist if required, numbering about 11,000 rifles, 280 sabres, and (possibly) 24 guns, making a total of 25,400 rifles, 1,920 sabres, and 78 guns. Deducting Maud'huy's division, Ducrot could bring into action against them at least 81,000 Infantry and 126 guns. In order to reap the full advantage of this superiority, and to make himself master of the section between the Seine and the Marne at the first determined onslaught, it was necessary, in the first place, that the attack should come as a surprise as far as possible, and, secondly, that the neighbouring sections should be prevented from sending assistance to the threatened spot in time.

The surprise was possible, provided that sufficient passages over the Marne could be prepared unnoticed, for the assembly of the troops on the manœuvre-ground at Vincennes could be effected without being seen by the enemy. The preparations for crossing the river were admirably made, with one single, but extremely important, exception. The Engineers charged with the bridging arrangements were probably so well acquainted with the sites and the peculiarities of the watercourse, that they did not think a special examination of them necessary before the construction of the bridges was necessary. Had they made one, they would probably have discovered that the ruins of the blown-up bridge at Joinville—an action of which the foolishness was now recognized—had seriously blocked the waterway. It would then have been possible to take this fact into consideration in good time. But the sudden and unexpected discovery of this obstacle threw the whole scheme into confusion.

One oversight leads to another, and so it was in this case. The success of the enterprise would not have been prejudiced in any way if Trochu, on learning of this obstacle, had immediately decided to postpone it, and had communicated the fact to all concerned. The telegraph enabled this to be done in the very shortest time. Instead of this, he gave his subordinates time to commence operations, which in some cases promised success. But by this means the Germans were enabled to recognize them as feints, which again afforded them a decided indication of the actual point of attack, so that they could take steps accordingly. The seizure of Mont Avron, which is not to be regarded as a demonstration, but as the opening move of the main operation, also contributed to this result. This measure the besieger was bound to recognize as the intended starting-point for an undertaking of some magnitude, especially as its influence upon his own position immediately made itself so strongly felt. When the obstacle in the Marne was found, it was too late to stop this move. This instance only shows how important it is that when such schemes are to be prepared, and suddenly carried out without being discovered by the enemy, the very smallest details should be considered, tested, and provided for.

For the second point to be considered by the besieged in preparing for this enterprise—that of preventing the neighbouring sections from assisting the threatened one—the configuration of the ground was extremely favourable. The sections on both sides of the one to be attacked were divided from it by rivers. This in itself

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made support difficult, by confining the troops to defiles, but further made it possible to interfere with it from the fortresses by directly acting against the crossings, either by rendering them useless, or by driving the troops away from them. The former result was at least partially achieved by taking up the position on Mont Avron, and the XII. Corps, being seriously menanced by this suddenly occupied artillery position, as well as by the Section Garrison under Admiral Saisset, and also by Exéa's Corps, must have felt considerable misgivings about sending the Wuerttembergers assistance by a crossing so much more distant, with the possibility of not being able to recall it if needed. The demonstration on the left bank of the Seine could hardly be expected to produce the impression of being intended to reach and destroy the bridges at Villeneuve St. Georges, but General Vinoy had such a considerable force at his disposal, that it might well be able to hold fast the 6th Corps on this bank, provided the advance was not made on the 29th, but simultaneously with the movements on the right bank, namely, on the 30th.

The forces between the Seine and the Marne were not so favourably disposed. The importance attaching to the advance of Susbielle's division was considerable; it was expected to join hands with General Ducrot's 1st and 2nd Corps at Ormesson, for which purpose its strength of 8,000 men, making it the weakest division of the Second Army, was not sufficient, as it was opposed by two Wuerttemberg brigades. Trochu is therefore not unjustly censured for detaching one of the best divisions (Maud'huy's) from the Second Army for employment as garrison of the Villejuif section. For this purpose the Gardes Mobiles of the Third Army would have served as well. The attack on Bonneuil would probably not have been so unsuccessful if it had been carried out by the strongest French division, numbering 17,000 men, in conjunction with that of Susbielle. In that case the French would have enjoyed a superiority of over two to one.

The object of Ducrot's main attack was, in the first place, to push back the Germans, with four divisions, as far as the plateau, so as to obtain control of the Marne between Bry and Neuilly, at which point the 3rd Corps was to be brought across, when the left wing, now increased to three divisions, would advance to the attack of Noisy and Villiers. There was, at first, not enough room for six divisions to act, and only in this way was it possible to surround the German right wing, and drive them away from the Marne, an operation which could be materially assisted by the guns on Mont Avron. But here it was the execution of the plan that was faulty. The first part was completely successful, but for the carrying out of the second, General Ducrot had not enough patience. He should, even at the risk of heavy loss, have waited till at least one division of the 3rd Corps had crossed the Marne, and was ready to attack. This division should then, however, not have been moved towards Bry, but have turned on Noisy, whilst the other deployed on the left bank. By the precipitated attack on the villages held by the Germans, the forces were used up piecemeal, and achieved nothing.

The proposal brought forward by the well-known architect, Viollet le Duc, was that the defender should attack one or several of the more important of the positions held by the besieger, turn him

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out of them, and establish himself there; in other words, he was to bring about a forcible extension of the line of investment. The originator himself mentioned the following points as suitable objectives for his scheme—the heights of Fontenay aux Roses and Plessis Piquet on the South, those of Garches and Celle St. Cloud on the West, and those of Raincy on the East. Seizure of the first would have cut the communication between Versailles and Choisy le Roi, and, we may add, would have led to the capture of the whole of the German siege stores; that of the second would have compelled the Germans to evacuate Versailles; whilst the possession of the heights of Raincy and Mont Fermeil would have given the French the command of the plains to the North, and of the valley of the Marne. It will be seen that the positions named form part of the new fortifications of Paris, their importance having been recognized since the siege.

It cannot be denied that if the defender had succeeded in standing his ground in any one of these positions, the siege would have been rendered far more difficult, and its progress considerably impeded. Troops and artillery sufficient for the purpose were available. And in order to gain these points, several not unsuccessful starts were made. I would remind my readers of the attack on Bagneux by Generals Vinoy and Tripier, which was by no means without prospect of success, if only Trochu had supplied the necessary troops instead of interfering with it. The first step towards the seizure of Raincy was taken when Mont Avron was occupied, and although this was done for other reasons and for a different purpose, it might very well have been utilized for the purpose of further exploiting the advantages already gained in this quarter. It is not improbable that if the defender had employed his troops and resources in this direction, instead of using and sacrificing them in attempts to break out like that at Joinville, or, worse still, against Le Bourget, and the line of the Morée on November 21st, he would have obtained quite considerable advantages. It would have been as difficult to do him any damage whilst he held a position from Mont Fermeil to Clichy, as it was easy to drive him away from Mont Avron by means of heavy guns. And with the capture of Bagneux and the heights of Chatillon, he would have frustrated all the efforts that were made towards collecting a siege park on the South side of the fortress.

By what means this was to be carried out, the Parisians have demonstrated. It may be accomplished by gradually pushing forward shelter trenches, or by turning the enemy out of his positions by main force, and establishing oneself in them by rapidly bringing up all available artillery and technical stores; the systematic advance must be assisted by any and every means at one's disposal. That is how the besieger must act, and that is how the defender did act in this case, because he enjoyed the powerful support afforded by the heavy artillery which was denied to the former. This shows us the aims an able and energetic defence can aspire to, and which it is not impossible for it to realize if the attack does not prove to be equal to its task. It also indicates how extensive may be the actions to be fought in the foreground of a modern fortress in a siege of the future, actions in which heavy artillery cannot be dispensed

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with, but in which, as is its due, the Infantry will always play the leading part, and for which it is its bounden duty to adequately prepare itself.

There is but little more to be said about the measures adopted by the besieger. It is so extraordinary as to be almost incredible that the bridging operations, lasting a day and a night, entirely escaped the notice of the German outposts on November 29th. The German position on the peninsula of Joinville no doubt benefited by having the Marne in front of it as an obstacle, and may therefore have been less heavily fortified than other sections of the position of investment. But this surely entailed the obligation of carefully watching that obstacle. This could be done not only at Bry and Champigny, but very well also at Joinville, and should have been effected by frequent patrolling, if it really was impossible to send forward strong standing patrols to establish themselves in the close country in front.

Another peculiar circumstance strikes one in connection with the position on the plateau. Whether the Marne was observed directly or otherwise, it was necessary, supposing it to be possible for the French to cross the river, to be able to oppose the deployment of their forces on the peninsula by all means available. The ground favoured this procedure, for a powerful artillery posted on the hills at Champigny and Bry would so completely dominate the peninsula that an attack could hardly be thought of. And yet not a single gun emplacement had been constructed on them. The batteries which came into action temporarily during the days of battle, had to do so without any of that protection from the fortress guns which they so greatly needed. But, as with the position of Servigny before Metz, the reason for this neglect of what was almost a "text-book" artillery position, may be sought for in the prejudice with which, in those days, villages were considered to be almost the only useful tactical points, and which caused the defence to cling to them, without stopping to consider whether they were at all suitable, or whether the ground was more favourable to another arrangement. Now, Villiers and Coeuilly themselves are not unfavourably situated for defence, and as part of a retired position their relative positions enabled them to render excellent service. But their favourable situation on the plateau should not have been allowed to obscure the fact that their retention or otherwise could not exercise the least influence on events taking place on the low ground in front of the plateau, and that artillery brought into action to support them could not prevent the enemy from utilizing the peninsula for his deployment, or from ascending the slopes unmolested.

So quite apart from the fact that the conditions of the siege required the position to be further advanced, purely tactical reasons demanded that the Artillery position should be on the forward edge of the plateau, with the addition of a strong Infantry position on the forward slope, or at its foot, the very thing, in fact, that was done after the fighting at Villiers. The energy with which gun emplacements were then constructed is sufficient proof of what was needed.

One word more about Le Bourget. On December 21st it was only held by five companies, and they were not supported by even a

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single gun, because "after the action of October 30th it was not intended by the Supreme Headquarters that the place should be held to the utmost." If the Commanding Officer had accordingly been ordered to retire before superior numbers, he committed an error in remaining, for he could hardly fail to observe the enormous strength of the forces opposed to him. Then, however, it was another error on the part of the officers commanding in the main position in rear to send assistance, instead of ordering the garrison to retire. Success has justified them, and thus wiped out the error. But was it right to leave this small garrison quite isolated, and without a safe line of retreat, so far in front? Surely it would not have been difficult to have at least installed telegraphic communication between it and the main position, as was so frequently done in the case of important points in the front line, and then the superior authorities could have easily either ordered the action to be broken off, or arranged to send sufficient reinforcements in plenty of time. The neglect to provide this communication nearly led to the garrison being sacrificed to what was possibly a wrong conception of its duty.

The success, however, further demonstrated that the stubborn defence of the place was the right course to adopt. For by this means the French were prevented from carrying out their intended attack on the main position. The importance of the point was further shown by the fact that they commenced to advance against it by means of regular approaches, which they carried to within a few hundred yards of it. And even then—in spite of all—Le Bourget continued to be held. This proves that the garrison was able to maintain itself there, in spite of the fire concentrated on it, and supports the opinion I have already advanced, that the Guards could quite well have held a position, including Le Bourget and Drancy, which would probably have prevented all the heavy and sanguinary fighting for the possession of Le Bourget. The Artillery could also have come into action on this line, just as well as it did on other fronts at a less distance from the works, and just as well as it was able to on December 21st, with a loss of seven killed and 21 wounded among seven batteries.

The struggle for Le Bourget was the last in which the German troops were restricted to the stubborn defence of their positions against Infantry that was always superior in numbers, and in the face of the depressing and destructive effect of an enormous force of Artillery. They had passed through 100 days of waiting and of most exhausting inaction, which none but an army so strongly knit together and so imbued with devotion to duty could have survived without suffering serious injury. The lesson which the suffering of this army has taught will not be forgotten. The besieging army needs heavy guns from the very beginning of the siege—that is to say, of the investment—not for the purpose of bombardment or of commencing a regular siege, but because, in order to attain tactical equality, it is necessary for both sides to have equally effective arms, unless the troops provided with the inferior equipment are to be seriously overstrained in the attempt to restore the balance.

[End of Volume III.—Investment of Paris].

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CONTENTS.

Coast Defences *versus* Ships. Translated from "Mittelungen über Gegenstände des Artillerie- und Geniewesens." January, 1907. Communicated by the Director of Military Operations 119

A Comparison of French and German Field Artillery. Translated from "Jahrbücher für die deutsche Armee und Marine," by Lieut. H. G. de Watteville, R.G.A. 126

Covered Artillery Positions. Translated from "Militär Wochenblatt." Nos. 30 and 31, March 1907. By Captain F. A. Buzzard, R.F.A. 132

Infantry fire against Shield Protected Batteries. A précis by Lieut. A. F. P. Wehner, R.G.A. 136

Proposed increase of the French Artillery. Translated from the "Revue d'Artillerie," for December, 1906. By Colonel A. H. C. Phillpotts, late R.A. 137

"Revue Militaire des Armées Etrangères. Précis of contents. February, 1907, by Captain F. A. Buzzard, R.F.A. 140

"Militär Wochenblatt." Précis of contents. March, 1907. 140

"Vierteljahrshefte für Truppenführung und Heereskunde." Vol. I., 1907. Précis of contents 140

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Coast Defences *versus* Ships.

By MAJOR S. MIELICHHOFER, AUSTRIAN ARTY.

TRANSLATED FROM "MITTEILUNGEN UBER GEGENSTANDE DES ARTILLERIE- UND GENIEWESENS," JANUARY, 1907.

Communicated by the Director of Military Operations.

THE subject of coast defence has of late aroused much attention in Military circles. This is satisfactory as showing that the importance of the question is beginning to be realised, and that coast defence is coming to the front at last.

Numerous contributions to Military literature testify to the interest now taken in the various problems of coast defence. It is only natural that, together with much good work, many essays of questionable soundness should have been given to the world.

The views expressed in the latter essays should not be altogether disregarded, but should be considered rather as stimulating discussion and elucidation of individual moot points in the domain of coast warfare. And it is in this light that I hope that my present essay will be regarded.

The combat between forts and ships may be regarded *(a)* from the artillery, *(b)* from the purely tactical point of view. The two questions are closely connected, since the result of tactical undertakings against defended harbours usually depends upon the fire effect of the forts upon the ships and vice versa.

But there are many possible cases in which one of these two factors, fire-effect and tactics, may so far outweigh the other that the minor factor may be neglected. From the higher military standpoint we have to consider the total result rather than the component factors which affect it. The discussion of such cases would carry me beyond the limits of the present essay. I will, therefore, confine myself to the separate discussion of the two factors, fire-effects and tactics. But it must be borne in mind that in actual war the two factors will have to be considered in combination.

(a) Fire Effect:—

The fire effect of the artillery depends principally on the striking energy and on the probability of hitting.

As regards the first, the artillery armament of coast forts is designed to serve the same purpose as that of the naval guns, namely,

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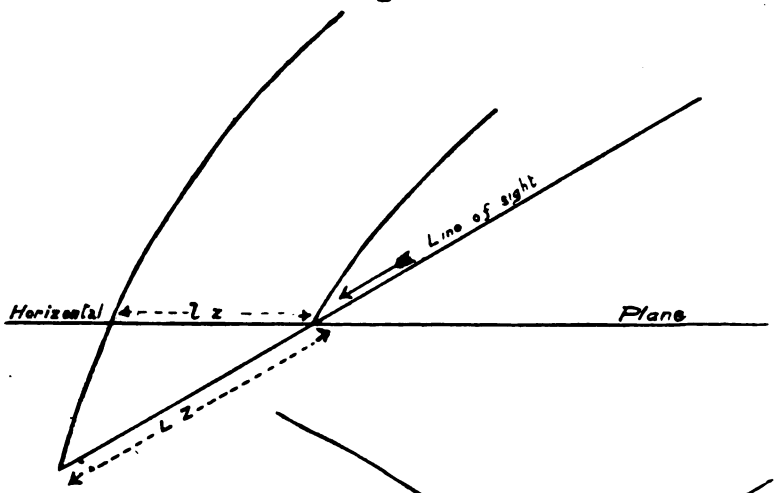
to attack ships. We may, therefore, assume that the high velocity guns of the ships and of the forts are of the same power, and we may confine our attention to the probability of hitting.

Assuming that the guns on either side are equal, there is one important matter which affects their relative probability of hitting, and that is their command, or relative height above sea-level. The accuracy of a gun is measured by its 50 per cent rectangle; but the rectangles of two similar guns, opposed to each other, are only equal when both guns are on the same horizontal plane.

Fig. A.



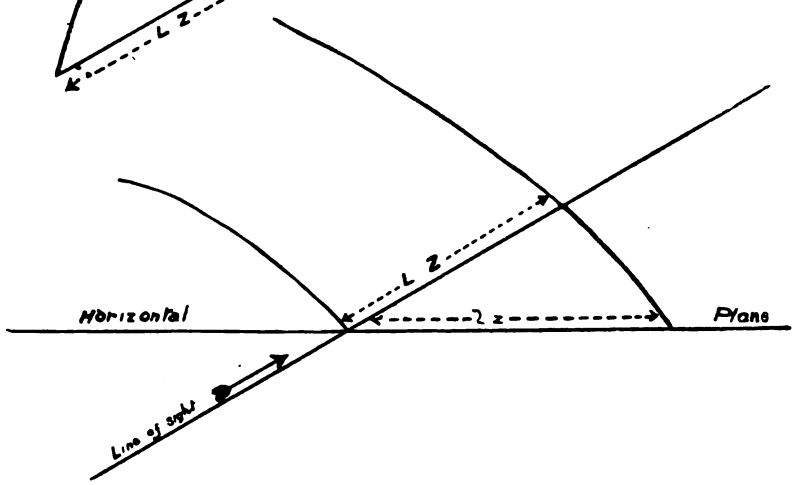


Fig. B.

When, as is usually the case, the fort guns have greater command than the ship guns, so that the latter shoot upwards and the former downwards, then they cease to be on equal terms.

The target of a ship gun is the gun emplacements of the fort and the adjacent cover. Both of these constitute horizontal targets. To compare this target with that afforded by the ship, we must reduce the latter to a horizontal target; that is, we must consider it as

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the projection of the exposed portions of the ship upon a horizontal plane, namely, the surface of the water. For practical purposes we may neglect the lateral dispersion and consider only the 50% length zone. And this zone must be calculated not with reference to the horizontal plane passing through the muzzle, but with reference to planes above and below the muzzle, namely, the fort emplacements and the water-line of the ship respectively. For our present purposes it will be sufficient to assume the principle of the rigidity of the trajectory, to take the 50% length zone in the plane of the line of sight, and to reduce this to its projection upon the horizontal plane passing through the point of impact.

In Figs. A. and B. let L Z be the 50% length zone measured along the line of sight, and l z the projection of this zone upon the horizontal plane passing through the target. It is evident that when firing downwards, as at A., the actual 50% zone l z is shorter than the theoretical zone L Z measured along the line of sight. When firing upwards, as at B., the reverse is the case. In other words, firing downwards, increases the accuracy of a gun, while firing upwards decreases it. This gives the gun in the high sited fort a certain advantage over the gun on the ship. On further consideration it will be seen that the value of this advantage is not only a function of the angle of sight (due to the command of the battery) but also a function of the range.

That is, in the case of the fort gun the longitudinal dispersion, or error, is reduced by the height of the fort but increases with the range. In the case of the ship gun, shooting upwards, the longitudinal dispersion is immoderately great at short ranges, and then decreases as the range lengthens up to a certain point, after which the normal error of the gun predominates over the modifying effect of the angle of sight.

The soundness of this demonstration is shown by Table I., which gives the length of the 50% zone for a Krupp 28 c.m. (11-inch) coast defence gun at different ranges and different heights above sea-level.

TABLE I.

Range Metres.	Length of 50% zone, metres.							
	At the water line.				At the level of the battery.			
	Height above sea level, metres.							
	0	25	50	80	0	25	50	80
1000	26	11	6	3	26	— *	— *	— *
2000	31	19	12	9	31	107	— *	— *
3000	37	28	23	19	37	53	103	— *
4000	44	38	34	30	44	52	64	92
5000	52	48	43	40	52	57	62	76
6000	60		54	51	60		69	73

NOTE. For the first four columns the gun is assumed to be firing downwards at the ship; in the last four upwards at the battery. Where marked * the angle of incidence is negative.

This table also shows that the most favourable range for ship guns against a battery 25, 50 or 80 metres high, is 4,000, 5,000 or 6,000 metres respectively. At these ranges the error of the ship guns is least and that of the fort guns is greatest; in fact the former does

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not much exceed the latter. At greater ranges the error of the ship guns further increases and places them at a still greater disadvantage with reference to the fort guns.

Assuming, then, that the command of the fort is within the ordinary limits of 25 to 80 metres (82 to 262 feet) above sea-level, then the best fighting distance for the ships will lie between 4,000 and 6,000 metres.[1]

As an instance, we will take a coast defence battery with 4 heavy guns. This may be considered as a gun-platform with an effective depth of 20 metres, including the crest of the parapet. Any hit on this area would seriously affect the working of the guns. But few coast batteries would offer such an extent of vulnerable area. As against this we will take a ship with a free-board of only 4 metres (a very low estimate) reduced by calculation to a horizontal target at the water-level. Then Table II. gives the length of the dangerous zone, corrected for height of gun above sea-level; it also gives the virtual length of the horizontal target formed by the ship. In the last columns I have entered the percentage of hits which would in my opinion be made under service conditions; this has been taken at about ¼ of the theoretical percentage.

Two facts may be deduced from this Table. The first is that as already deduced from the 50% zones, the best fighting range for a ship is from 4,000 to 6,000 metres, according to the height of the fort. The second is that as the range increases the percentages of hits made by the fort gun and the ship gun tend to approximate. This is only natural, since as the range increases a given difference of height becomes of less importance; at an extreme range the ship and the fort might be considered on the same horizontal plane.

From the naval gunner's point of view it would be a mistake to consider only the chance of being hit by the fort. This would mean fighting at extreme ranges, at which the ship would make but few hits. What is required is to determine a fighting distance at which the ship will make a tactically sufficient percentage of hits, while the percentage made by the fort will be sufficiently reduced. And, as the Table shows, this distance lies between 4,000 and 6,000 metres (4,400 and 6,600 yards).

This investigation confirms the rule laid down in my book on coast defence, that ships must engage forts at ranges of 5,000 to 6,000 metres in order to produce the (relatively) greatest effect.

Several writers have recently advocated an opposite policy, namely, that the fleet must dash forward rapidly to close ranges of 2,000 to 3,000 metres. If they can succeed in maintaining themselves at this short range it is contended that (thanks to the greatly increased power of modern guns) the effect of their fire upon the forts will be decisive. As we have seen, from an artillery point of view this contention is unsound. An Admiral adopting such tactics would have reason to regret his action. For not only would he increase the relative percentage of hits made by the fort, but these hits would be more effective owing to the increased penetrative and destructive

[1] Note by Editor—
In his book on Coast Defences, Major Mielichhofer assigned 80 metres as the maximum height at which it will be desirable to post heavy coast defence guns.

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TABLE II.

Range Metres.	Dangerous Zone. metres.				Horizontal target afforded by ship. metres.				Theoretical percentage of hits. Against the battery.				Theoretical percentage of hits. Against the ship.				Service percentage of hits. Against the battery.				Service percentage of hits. Against the ship.			
	Height above sea-level, metres.																							
	0	25	50	80	0	25	50	80	0	25	50	80	0	25	50	80	0	25	50	80	0	25	50	80
1000	127	30	17	11	528	140	88	64	41	—*	—*	—*	98	98	98	98	10	—*	—*	—*	24	24	24	24
2000	62	35	23	18	268	160	112	92	34	11	—*	—*	98	98	98	98	8·5	3	—*	—*	24	24	24	24
3000	37	28	22	19	168	132	108	96	28	21	11	—*	98	98	98	98	7	5·5	3	—*	24	24	24	24
4000	26	21	20	17	124	104	100	92	23	21	17	12	93	92	94	94	6	5·5	4·5	3	23	23	23	23
5000	19	17	16	14	96	88	84	76	20	19	17·5	14·5	77	77	79	79	5	5	4·6	3·7	19	19	19·5	19·5
6000			13	12			72	68		15·5	15				62	63		3·9	3·8				13	13

NOTE. Where marked * the angle of incidence is negative.

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effect of the enemy's fire at close ranges. And this would seriously reduce his effective force in the final stage of the combat, namely, forcing the inner line of the enemy's defences.

On the other hand, it will be the duty of the coast-defence artillery to prevent the ships from maintaining themselves at the above-determined favourable range of 5,000 to 6,000 metres. And this will have to be effected principally by howitzer fire, since at 6,000 metres even heavy guns will hardly penetrate armour.

Generally speaking, the duty of flat trajectory guns will be to support the howitzers. Since they cannot hope for any great effect from each individual round, they must endeavour to secure effect by making a large number of hits.

During this distant phase of the combat auxiliary coast-defence guns will have plenty to do. For battleships expose a great surface of vertical unprotected side, and complete armour protection is still considered an impossibility. Even if any power were to introduce complete armour, yet its older ships would remain long enough in the Service to afford a field of utility for existing medium calibre coast-defence guns.

(b) Tactics:—

This is a purely naval question, and will only be touched upon to avoid leaving this essay incomplete.

In the first place, if the fleet endeavours to approach to close range and thence to pour a great volume of fire upon the forts, it is probable that the ships will strike the outer edge of the zone of mines. It is idle to neglect this possibility and to base naval tactics upon a hypothesis of clear water; such an assumption would render the scheme of no practical value.

In order to advance to the close attack position the minefield must first be swept clear. And, as advocated in several recent works, the process of clearing the minefields must be simultaneous with the fight for the close attack position, which fight will be carried on from the most favourable artillery position as defined above.

Clearing the minefields to secure a safe approach is one of the most difficult and dangerous operations which the navy are called upon to execute. Once the channel is cleared it would be a gross violation of tactical principles not to utilize this success at once for the true object of the attacking fleet. And this object is the destruction of the enemy's ships in harbour, not the attack of his coast defences. The latter is merely an incidental combat in which it is necessary, in self defence, to engage, until the channel into the harbour has been cleared.

This is confirmed by the tactics of the Japanese fleet before Port Arthur. In this case there was no question of forcing an entrance, both on account of the difficulties of the channel, and because the Russians had not yet assembled the whole of their naval forces at the theatre of war. It was necessary either to force the ships in harbour to come out and fight, or else to destroy them in the harbour by siege artillery fire. Consequently, Admiral Togo took very little notice of the coast defence forts.

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The tactics of an attacking fleet may be summed up as follows:—

As soon as a sufficiently wide channel has been cleared through the minefield, the fleet must advance straight from the 5,000 metre position to attack the ships in harbour. It is useless to stop and fight the forts at close range, for two reasons; first, because, as we have seen, such an attack is less effective than an attack from 5,000 metres; secondly, because such a proceeding is a mere waste of time. At this critical moment the attacking Admiral must have only one object in view, namely, the destruction of the enemy's ships. He must absolutely disregard the coast forts and their guns.

If we now consider the factors of fire-effect and tactics in combination, we find that these are in no way opposed to one another. Artillery science shows that the ships should fight at a range of 5,000 to 6,000 metres from the fort, and that their fire-effect suffers if they fight at closer range; tactical science shows that it is a waste of time to take up a second position at close range, and that the advance should be from the main fighting position straight into the harbour.

There is another point which affects the tactics of the attack. The ships can only reckon, under normal circumstances, upon a small percentage of hits on high-sited forts, or even on forts at a moderate height above the sea. It is improbable that they will be able to destroy or completely silence the forts. The ships carry comparatively few rounds of ammunition, and this is difficult to replace. Therefore the duel between ships and forts is not a battle fought with the object of destroying the fort, but is rather an operation undertaken to prepare and to cover another operation of the fleet, namely, clearing the minefields. By engaging the forts and drawing their fire, the attacking ships endeavour to prevent the forts from interfering with the clearing of the channel.

From the defender's point of view it would be a mistake to concentrate the whole power of the defence on the duel with the ships; the most important phase of the fight is the defence of the minefield.

From these premises we may deduce the extent and nature of the defensive armament of a harbour which has to be defended. We must first consider the attacking force of our adversary, the construction of his ships and the number and power of his guns. We can then calculate the probable number of hits that he will be able to make; and we must then arm our defences so that our forts can make at least an equal number of hits, in order to maintain their superiority. Knowing the probable percentage of hits that our own guns will make, we can calculate the number of guns that we shall require to engage an adversary of given strength.

This question, and the allotment of guns of different calibres to the defences, must be dealt with in a separate essay.

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A Comparison of French and German Field Artillery.

Compiled from various articles in "Jahrbücher für die deutsche Armee und Marine," principally from an article by Major Rüppel in No. 401 February, 1905.

By Lieut. H. G. de WATTEVILLE, R.G.A.

It is admitted by all German authorities that the adoption of a new Q.F. materiel by the German Field Artillery must be followed by considerable changes in the tactical employment of that arm in Germany.

The two main characteristics of the new French materiel, which have so greatly altered French artillery tactics, are:—

(1.) The high rate of fire.

(2). The protection of the detachment by steel shields.

Before investigating the tactical aspect of the matter, certain details of the new French Artillery organisation, which exert a great influence on tactics, should be clearly grasped. Foremost of these are.

(a). *The number of guns per battery.* This is four. The reasons leading to this reduction are too numerous to be quoted. The weightiest, however, was the impossibility of one man controlling the fire of 6 Q.F. guns; the fault, it should however be observed, is largely due to the French methods of fire.

It is also most important to reduce the frontage occupied by the artillery of an Army Corps; also a thorough utilization of cover is simplified by the fewer guns. With the new materiel the reduction in guns is not a reduction of fire effect. The fire effect of the 4 gun battery seems sufficient to answer any purpose. Under any circumstances the smaller battery is infinitely to be preferred for the horse artillery of a cavalry brigade, and the division of the 12 guns into three batteries of 4 pieces will probably be adopted in Germany, even if the larger field batteries remain.

(b). *The grouping of units.* Both in France and Germany three batteries are formed into a group. In both countries the group is the tactical unit. But in France each infantry division receives only 2 groups of guns, whilst the remaining 3 or 4 groups remain under the chief commander as Corps Artillery. Thus the French Army Corps possesses 84 or 96 guns as against the 144 of the German Corps. This superiority of the latter however, vanishes when the ammunition supply is considered. The German Corps carries 26,112 rounds, the French 26,208 or 29,952.

The abolition of Corps Artillery in Germany can be traced to its faulty employment in the War of 1866. The question has since been keenly discussed, for many German authorities consider Corps Artillery to be indispensable. All leading military men in France declare it to be a necessity, and blame the German system. In Germany even the opponents of Corps Artillery admit its utility on the defensive. To construct Corps Artillery out of the divisional artillery on an emergency is not practicable. Since howitzers are seemingly the most suitable materiel for Corps Artillery. It is now advocated that the present German howitzer group be expanded into a Regiment of two groups to act as Corps Artillery; each Regiment from which the howitzer group has been taken should then receive a group of guns. This entails the formation of six new batteries for every Army Corps. But, should the batteries be reduced from six to four guns, then the total number of guns per Army Corps is reduced from 144 to 120. Moreover, if the ammunition supply be increased, the fighting value of artillery, as well as the facility of its favourable disposition on the field of battle will be greatly increased.

Few details concerning the French high angle equipment have been published. The batteries armed with the short 120 mm. gun in peace time belong to field artillery; in war they would be relegated to the heavy artillery of the field army. They must therefore lose their mobility and become unavailable at the beginning of an action. The new Rimailbo six inch howitzer is as yet in an experimental stage.

(c). *The Sub-division of the Battery.* Owing to the rapid consumption of ammunition with the new materiel, the French have allotted one ammunition

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wagon to every gun. Gun and wagon have become inseparable at drill, manœuvres, and practice.

These four guns and wagons, together with two wagons containing "the first reserve" constitute the fire unit. The remaining six ammunition wagons of the battery belong to its first line transport. Both in France and in Germany the fire units and the first line transport are linked together. The difference between the French and German group is, that each French battery possesses 12 wagons, while the German has only 10 (including the limber of the food supply wagon = ½ a wagon, and 3½ wagons of the light ammunition column). In the firing line the French battery has 6 wagons, the German 3. In the rear of the French group there follow the remaining 6 wagons, behind the German group there come 3 wagons and the supply limber; the remainder of the German ammunition is with the light column in rear of the fighting troops of the entire division. The French battery moreover, carries its ammunition closer to the guns, and only divided into two portions.

Ammunition taken into the field.

Where Carried.	French Battery.	German Battery.
In the Battery	672	480
In rear of the Artillery Brigade	576	300
" " Infantry Division	—	308
Total rounds =	1248	1088

The presence of the wagons in the column of route in front of the infantry is not a serious matter. It is a necessity in face of the development of Q.F. artillery, and will have to be adopted in Germany. At most this will set the infantry back some 800 or 900 yards.[1]

(d). *Tactical Formations.* These in France are very simple. Besides the column of route, in which every gun is preceded by its wagon, the only formation is the column of Sub-sections. The two "first reserve" wagons always follow the guns; in line one of these stands in rear of either flank gun.

In action gun and wagon are placed close together so as to facilitate the ammunition supply, and to protect the detachment by means of the armoured bottom of the wagon turned up to face the enemy. German authorities state that, in concealed positions, where the wagon is less exposed to a direct hit and visibility is of no account, this arrangement is practical.

In open positions they would choose a position for the wagon some 10 to 20 paces behind the gun; still it is not certain whether an exploding limber would not do some damage to the gun or detachment at that distance.

In France the rate of march for artillery by itself over not difficult ground is laid down at 5 miles an hour. Germans consider this very good, in France great emphasis is laid on the fact that the chief source of fatigue for the horse is the rider's weight, and that every effort must be made to shorten the time during which he is subjected to that burden.

Ammunition supply of Q.F. *Matériel.*

Country.	Number of guns per battery.	Number of wagons: With the Battery.	Number of wagons: 1st Line of Transport.	Number of wagons: Total.	Wagons per Gun.	Number of Rounds on Wagon.	Rounds per gun with the battery (Limber included).	Remarks.
France	4	6	6	12	3	96	312	* To be increased.
Switzerland	4	?	?	10	2½	100	290	
U. States of America	4	?	?	12	3	106	358	† Has detachable shields
Denmark	4	6	?	6*	1½	120	224	carried on a cart.
Sweden	4	6	4	10	2½	112	324	
Norway	6†	6	6	12	2	100	221	‡ Probable reduction to
Holland	6‡	6	6	12	2	104	248	four.

N.B. The German ammunition supply has not yet been officially published.

[1] The armoured French wagon is tipped backwards and the two armoured lids open outwards like doors, protecting the ammunition numbers. The wagon when tipped suffers from lack of mobility. Denmark has adopted the French system. Other similar wagons, which however are not tipped, have been adopted by Switzerland, Sweden, Holland, Turkey and Roumania. The United States and Norway have not armoured their wagons. All these countries have fixed ammunition.

The French pack their rounds singly; the wagons are fitted with a species of rack from which the cartridges are pulled out to the rear. The Americans have adopted a similar plan. Denmark has baskets holding four rounds apiece. Norway has also a species of basket made out of cocoanut fibre. The Turks use Indiarubber rings. The Norwegian system has very many advantages, and is probably to be followed in Germany.

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French Artillery marching alone is divided into groups of 10 to 12 vehicles, which march independently of each other. This is thought in Germany to be suitable for peace, but to spoil the troops for war conditions.

At a long ascent the French regulations allow the gunners to walk. This is done to some extent in Germany, and German Artillery officers recommend an extension of the practice.

In France, artillery is ordered to form part of the advanced guard of a column of any size, in Germany this is left to the discretion of the commander. In France the artillery of the main body is placed near the head of the column; some French officers advocate its position at the end of the larger units to which it is allotted, or even in the interval between advanced guard and main body. German opinion is against the latter view, but desires a forward position admitting of a rapid development.

After the adoption of the new materiel there was a marked tendency in France to attack the old principles of the employment of artillery in mass, and of the concentration of fire. This was a return to the times of "the battalion gun." Now, however, the French Regulations have gone back to these irrefutable principles, though in a slightly modified form.

The German idea is to obtain a speedy artillery superiority of fire by the simultaneous deployment of the greatest possible number of batteries; the French principle is that of "the economy of force," i.e.: the use of only as many batteries as are necessary for a rapid attainment of the desired effect. The number of batteries depends exclusively on the front of the target to be fought. One battery at medium ranges (2,700-2,800 yards) can effectively deal with a front of 110 yards, when using ordinary time shrapnel, and 220 yards if sweeping is brought into play. The French hold it a mistake to use a single gun more than is essential; they say it is waste of ammunition, and of artillery power. The batteries not firing must be retained as a reserve. This is necessary because the batteries of both sides will continue destroying each other, until victory will favour that artillery which can put in the last intact battery. The French are specially emphatic about keeping a few batteries in readiness at the commencement of an action after the opening of artillery fire, so as to answer without delay any hostile guns then coming into action. These batteries standing in readiness are not kept back as a reserve, but are brought into position *en masse*. The French thus substitute for the German "employment masses" the "readiness of masses," thus guarding against an insufficient initial deployment of force.

These batteries in readiness are classed into:—

(1). "Batteries en position de surveillance,

(2). "Batteries en position d'attente,"[1]

according as they stand unlimbered on the position, or limbered up just in rear of the probable position. The B.C's of either class of battery are ordered to take every step necessary to opening fire at any point of the area commanded by their guns, where the enemy may be expected.

The employment of individual sections is only practised by French and German alike in order to sweep a road or defile. The French Regulations owing to the greater fire effect of the Q.F. gun, allow the occasional use of a single gun.

German opinion is favourable to the principle of the economy of forces provided that it does not lead to the use of artillery by driblets, and to a struggle against numerical superiority. This the French seek to avoid by their "masses in readiness." Both French and Germans aim at a superiority of fire from the outset.

The "economy of force" principle is thus sound, and for the French becomes a necessity. The risk of wasting ammunition with Q.F. guns is obviously very great. Also with shields a fight against odds is no longer so serious, since the battery may at any moment cease fire, while the detachment remains fairly safe behind the shield.

The estimation of the number of batteries to be employed according to the front of target to be engaged seems to be not unpractical. This number, however, can only be ascertained in the course of an action. The French batteries "in readiness" are designed to engage a front which increases as the action proceeds.

Similarly the French have modified the old theory of the concentration of fire to meet the new conditions for the obtainment of fire superiority. The French regulations state that—"Artillery fire reaches its maximum power by concentration;" but French authorities maintain that "Rapidity of fire has replaced concentration," and "Converging fire has become divergent." The rapidity of fire of the modern battery is 5 to 10 times that of the older one, and so one new battery can do the work of 5 or 10 old ones. Concentration in many cases becomes unnecessary, but even the French admit a concentration of guns at a dangerous target. An unnecessary concentration leads only to waste of ammunition. If economy of force is identified with economy of ammunition, then the principle is sound. Nevertheless, Germany is not ready to adopt the French methods until she can use the new shielded Q.F. materiel. Until then the French materiel can only be met by massed artillery and concentration of fire.

[1] (1) Batteries in position "of observation."
(2) " " "in waiting."

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There is little difference in French and German methods of Reconnaissance. Both demand a thorough preliminary inspection of the position to be occupied. But, whereas in Germany it is only recommended that the divisional artillery commander be accompanied on his reconnaissance by the commanders of artillery regiments, the French Regulations desire the inclusion in this duty of the group commanders. Further, the French battery commanders are called forward as soon as the group commanders have received orders. Germans admit this system to be more advantageous, since concealed positions and indirect fire require a most careful examination of the ground by the B.C. himself.

It is, however, in this matter of concealed positions that the French vary most from the Germans. They declare that entire concealment, especially at the beginning of an action is essential. They even maintain that an excellent concealed position becomes untenable when once located by the enemy. Against visible targets they continue indirect laying as being the most valuable aid to fire direction. Nevertheless, as an action proceeds the French batteries are ordered to abandon cover when advantageous.

The German idea of concealing the gun in such a way as to allow the layer to be able to see the target when standing behind the trail is condemned by the French as the worst possible method of concealment. The German dislike to indirect fire is entirely due to the want of suitable laying apparatus such as is possessed by the French. The latter are able to fire at moving targets, and can control the fire of many batteries, always using indirect fire. The Germans, owing to their want of suitable equipment can do neither.

The visibility of the French batteries is reduced by their grey paint, while the Germans still cling to their traditional blue.

The French avoid long lines of artillery which facilitate the enemy's ranging. Provided that the ground allows of it and that the unity of the group is not broken, German opinion approves of this. German Regulations merely allow artillery to fire over friendly troops and permit its formation in two lines, but it is stated that in echelon formations, the distance between batteries in depth is not to exceed the battery interval in line.

Owing to the increased power of the French gun the old limit of the first artillery positions, namely, at a range of 3,000 metres from the enemy has been abandoned. This range now depends more on the ground and other circumstances. Modern guns prohibit coming into action at decisive ranges. But the distant stations enforce a slow and painful approach to the shorter ranges. German batteries are ordered to take up their first position as close in as circumstances admit.

The French insist on a utilization of the entire front at the disposal of the artillery. The Germans maintain that it may be necessary to contract the front occupied by the guns in order to allow a reinforcement of the line without breaking up units. Although approving the French method as allowing a better utilization of cover and lessening loss, Germans prefer their system as facilitating fire control and the disposition of reinforcing batteries, the latter being more important as the proportion of guns in a modern army tends to increase.

Both French and Germans insist equally on concealing the approach of the batteries and the careful reconnaissance of the position. The French battery is favoured in this respect by the possession of 30 mounted men to 4 guns and 12 wagons. The Germans possess only 20 per 6 guns and 6 wagons. This enables the French to allot permanently 3 men per battery as scouts, 3 men as B.C's Staff, and one man as connecting file between battery and group. The group commander thus has 3 officers and 13 men at his disposal. With this personnel the French have devised an excellent reconnaissance and communication service. All German officers declare that their arm is totally deficient of such service and earnestly demand more mounted men.

The preparation for action of the French battery is somewhat lengthy. The argument is that in a concealed position this matters little, while it is of great importance that fire should prove effective immediately after coming into action. The French lay the greatest stress on this, and have equipped their batteries with excellent telescopes and rangefinders. The Germans admit their inferiority in this respect and desire the issue of stereoscopic telescopes to every staff and battery.

The application of fire is based on totally different principles in France and Germany. The French do not strive to strike one individual target, they aim at commanding and searching the entire ground which the enemy possesses, or over which he wishes to advance; this result, they say, must be attained by a rapid but certain fire effect. They reproach the Germans for utilizing the increases precision and rate of fire of the modern gun only to strike a few points on the battlefield in place of sweeping areas.

Against visible targets the French range with time shrapnel. Correctly distributed battery salvoes are employed with 2 to 3 seconds interval between the shots. The bracket is brought down to 200 yards only. Then at a range 100 yards less than the short side of the bracket 2 rounds rapid fire are ordered from every gun, and these two are followed by three more pairs of rounds, each pair having an increase of 100 yards range. A pause is then made, or a slow fire maintained.

Rapidity is obtained by:—

(1). The 200 yards bracket.

(2). Time shrapnel ranging.

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(3). The distribution of fire from the beginning.

Good fire effect is obtained by:—

(1) Ranging by salvoes.

(2). The decisive series at 4 ranges.

Ranging with time fuze—with bursts at a height of $\frac{1}{1000}$ of the range—permits of fuze correction during ranging, while the normal height of burst, $\frac{3}{1000}$ of the range, is simply obtained with the corrector. The French however, are familiar with percussion ranging too, but prefer the former. The Germans practice the percussion method alone. They admit that their preference dates from the days of small bursting charges and irregular fuzes.

The initial distribution of fire is a consequence of battery ranging. It facilitates finding the deflection and so makes for rapidity. Under certain conditions the French allow ranging with fewer or even single guns. German objections to this system are:—

(a). That battery salvoes retard the decisive series, since there are 2 to 3 seconds intervals between rounds. This with 3 salvoes means only 18 to 27 seconds more. Now this ranging includes fuze corrections and deflections, and now German opinion admits that with their method doubtful rounds, successive bracketing, fuze correcting, &c., wastes far more time.

(b). Waste of ammunition. This, so many Germans allow, is a doubtful question, since the greater certainty in ranging may save much. Besides it seems to be a matter of preferring greater certainty of fire effect, and so eventual economy, to a more doubtful effect with an initial economy. To say that rapid fire is obtained by the battery getting out of control of the B.C. is to object *in toto* to the Q.F. gun. The B.C. in truth need only use greater judgment.

In France the distribution of the fire of several batteries is effected by alloting a portion of the target to each battery before opening of fire. In practice the French have found that in firing at a single target one battery can obtain 45% hits, two batteries 57%, and that only in a longer time and using more ammunition. This system, Germans say, may prove an obstacle to changes of target. They prefer having ranging points well apart, and after ranging to distribute their fire. The rounds can be identified by using salvo or battery fire, and by time or percussion fuzes.

The French have abandoned common shell with time fuze. It is still used in Germany, but there is a strong feeling in favour of abandoning this complicated method of fire for field guns. Besides howitzers the true method of fighting troops behind earthworks is to draw them out by means of the infantry attack.

It is admitted on every hand that on adopting a Q.F. materiel German methods of fire will want a drastic reform for they are quite out of date when compared to the new French system.

The methods of fire control, changes of target, and observation of the target zones are much the same in France and Germany.

With regard to fire control the French do not seem to have worked out the possibilities inherent to the Q.F. gun. Opportunities for Q.F. guns will be fleeting and orderlies are too slow. The German Regulations allow the B.C. to change targets when danger threatens and the group commander to do so according to the tactical situation. It would seem far better to allot to these officers zones within which any change of target is admissible. The allotment of zones to the group commanders is indeed carried out by the French for the "observation of the battlefield." The numerous staff stands them in good stead. The greatest stress is laid on the support of other arms by artillery, and the fullest co-operation between them is to be aimed at.

When firing over their own troops French batteries are instructed to regard the space extending up to 550 yards in front of the guns and a similar space front of the target as dangerous to the friendly infantry. This is not a sound order, for this dangerous space must vary according to the range and the ground. The German instructions are more elastic and thus better.

The renewal of ammunition is carried out by French and Germans alike. Besides the four French wagons, the two "first reserve" wagons are placed some 16 yards in rear of the guns, one on either flank. This gives 72×6=432 rounds in the firing line; the German battery has 156. The new French wagons being tilted up near their guns are not like the German wagons, removed for exchange when empty. The gunners replenish them during pauses in the firing from the "first reserve" wagons. These, when emptied are then exchanged for the filled first line wagons. The 10 limbers, if not joined to the first line transport, stand 100 metres in rear; the transport remains 550 yards in rear. Germans prefer to have the limbers further in rear. The French battery has thus:—

$\frac{1}{3}$ of its total ammunition in the firing line.

$\frac{1}{6}$ of its total ammunition at about 110 yards in rear.

$\frac{1}{2}$ of its total ammunition not less than 550 yards in rear.

The German battery has:—

$\frac{1}{6}$ of its total ammunition in the firing line.

$\frac{1}{3}$ (about), of its total ammunition some 330 yards in rear.

$\frac{1}{2}$ of its total ammunition some 660 yards in rear.

The Germans consider their three wagons with 156 rounds as inadequate to supply Q.F. guns, and a new system will be introduced.

The French batteries are ordered to

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refill their firing line wagons before any change of position. The Germans discourage all changes of position; the French often consider them advisable. They go so far as to order changes of position in order to diminish the enemy's fire effect. Yet they declare at the same time that the great power of modern guns can immobilise artillery.

Further, they advise a change of position in order to augment their own fire effect. At the moment of the decisive attack there is to be an advance of a larger part of the guns. German opinion thinks the French over estimate the mobility of their guns. The greater power of the Q.F. renders such changes less indispensable. The French artillery commanders prepare their own change of position and reconnoitre the approaches to the new positions

French combined tactics are based on two principles, namely:—

(1). Success is only possible by the closest co-operation of the various arms.

(2). This success will be obtained only by a most resolute offensive.

Modern artillery compels advancing troops to seek cover; any forward movement can only be made by a simultaneous effort of all arms. To overwhelm the defence the Q.F. gun is the weapon *par excellence*. The Germans are in agreement with this.

The French maintain that co-operation must begin at the commencement of an action. The main duty of the artillery is the destruction of the enemy's infantry and the artillery engagement is only to be continued so long as this duty demands. This engagement must never be carried on without strong infantry support. A battle must never be divided into the preparation by artillery fire and the infantry attack. The artillery engagement will no longer end in the speedy silencing of one side. French regulations insist on great caution in treating a silent battery as silenced, for shields may cover an unharmed gun detachment.

Shielded batteries are to be attacked with time shrapnel until silent, some batteries are then to advance to a short range (even 1600—1900 yards), and to open with percussion fuze. Oblique fire is also recommended. The Germans think that concealed shielded batteries can only be attacked with small results, in the open only with great expenditure of ammunition and time. A new projectile would be best; failing this, curved fire with time shrapnel seems more promising, provided that a new time fuze be found.

The French Regulations seem to make no difference between the attack and the defence, only a few lines being devoted to the latter. Although shields much increase the defensive power of guns, German opinion considers that the functions of attack and defence require separate treatment.

At the commencement of an action the French advanced guard artillery is ordered to separate and to advance as far as possible under cover. A reserve of guns must be maintained. This method minimises losses and can deceive the enemy. The Germans object to it because it impairs the central fire control and leads to confusion of units. However they strongly approve of the reserve and of the application of the doctrine of the economy of forces to advanced guard artillery. They blame the desire of a concealed approach preferring rapid movements in advanced guard work.

In the development of the engagement both French and Germans aim at simultaneity of action, surprise and superiority of fire. The French strongly emphasise the necessity of other arms forming a safe manœuvring zone for artillery. They reproach the Germans with a too rapid deployment of guns unprotected by the other arms. French batteries during the first stages are ordered to support their infantry before attacking the hostile guns.

For the special preparation of the decisive attack the French divide their artillery more distinctly than do the Germans. To one portion they allot the tasking of breaking down the defence at the points of attack, while the remainder is ordered to engage the hostile guns.[1] A considerable number (nearly 50%) is entrusted with the latter task, because the shielded enemy's guns are harder to overcome. The Germans, still continue to allot the far greater proportion to supporting infantry. Again the French batteries that have carried out the special preparation finally advance with the infantry; about one half supports the attack, the remainder guard the flanks of the assault. The Germans do not send forward more than a few batteries or groups. They declare the French idea to be impracticable; the modern rifle, they say, renders such a move suicidal, the Q.F. gun makes it unnecessary.

Both French and Germans agree as to the end of the action and pursuit.

From the above it will be recognised that the French have modified their tactics in consequence of the possession of a Q.F. materiel. This process has been complete and absolutely logical. The great offensive and defensive powers of of the new artillery are thoroughly utilised. Germany is now adopting a similar materiel and fully recognises that she has much to learn from the French as to the modifications that this materiel must bring about in German tactics.

1 "Batteries de brèche and contre batteries."
"Batteries d'accompagnement and batteries d'encadrement."

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Covered Artillery Positions.

By LIEUT.-GENERAL H. ROHNE.

Translated from "Militär Wochenblatt." Nos. 30 and 31, March, 1907.

By CAPT. F. A. BUZZARD, R.F.A.

Note by Translator:—

[This article, of which the following lines are a somewhat condensed translation, is of interest for two reasons. In the first place it gives the views of a very experienced Artillery officer on a much debated subject, and secondly, it enables one to form some idea of the German methods of conducting the fire of Field guns placed behind hills or otherwise completely masked].

The "covered positions" referred to in this article are those which are so far down the reverse slope of a hill or behind such high woods, etc., that not even the flashes of the guns can be seen from the target, or even from any part of the ground in the possession of the enemy.

When attempts were first made to fire from covered positions with field guns, the general opinion was very much against them. Lately, however, there has been a strong tendency to overestimate their value. It has even been suggested that fire of this kind should be made the rule. Convinced as I am that fire from covered positions can, and will, be employed in war, and that it must therefore be carefully practised in peace time, I feel it necessary to combat the notion, especially where it is being adopted by officers in high command who are not artillerymen, that this can become in any way the normal procedure of Field Artillery.

A wise man has said that it is better to show how an error has arisen than to argue it out of existence. I shall adopt this plan.

The supporters of covered positions lay great stress upon the experiences of the war in the Far East, where it may almost be said that fire from covered positions became the rule on both sides. It does not, however, follow that this rule was sound.

The decision to adopt these positions was the natural reaction from the rashness with which the Artillery, particularly on the Russian side, where the ideas of Dragimirov prevailed at first, scorning the use of shields, came into action in completely exposed positions on the crests of hills.

The Russian Artillery suffered such losses from the shrapnel fire of the well handled Japanese guns when these tactics were tried that the mistake was afterwards avoided and covered positions taken up for choice.

I have read the reports of the shooting from these positions and of the results obtained with the greatest scepticism. Effect is not to be got from this kind of fire unless Officers and men are thoroughly trained in its use.

When I read in the reports that Artillery positions were selected from the map alone, that angles of sight were measured by moonshine with the aid of the fingers only, or estimated from the experiences of preceding days on entirely different ground (!!), I cannot deny these statements—the most incredible things do occur at times—but I do hold that it is quite out of the question to expect results even of the feeblest character, when firing under conditions of this kind.

The bitter experiences of the Russian Gunners in their exposed positions may be accepted as an excuse for their subsequent action, but an Artillery provided with shielded guns can never deduce from these reports that it also must seek out covered positions of the kind, and thereby of necessity lose in fire effect. The Russians might argue that they had been so overwhelmed with fire when exposed that they could not expect to obtain any effect in that way, and therefore took to cover, hoping at least to gain some results. I do not think that even this would justify the adoption of such positions as the reports describe, for I consider that these should not be taken up even by the heavy guns of a Siege Train.

It may be said without exaggeration that the effect of shrapnel fire upon a shielded battery will be not more than one sixth of that upon a battery not so protected. Fire which is not more effective than this can, and should, be endured.

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At the long ranges (2,500 to 3,500 ms.), at which the Artillery duel will be fought there are always positions to be found in which guns can be skilfully placed so that they will be very difficult to locate. Bushes, copses, cornfields and particularly folds in the ground will enable positions to be occupied from which the guns can be laid for line direct on the target by men standing up and from which the Battery Commander will be able to observe, whilst the enemy will only be able to see the flashes of the guns when they open fire.

Advocates of covered positions often point to the French Artillery, saying that it has adopted these positions as normal. This is not the case.

The French Reglement is quite clear on the point. Batteries are to take up such positions that fire can be opened without delay, and other technical considerations are of secondary importance. Advantage must of course be taken of cover afforded by the ground, when the first essential already mentioned is not thereby interfered with. Part I., para. 621 says: "Positions, particularly at the commencement of an engagement, are to be as far as possible taken up so that the batteries can only be located by the flashes of the guns. In another place, I. 647, we read: "Provided that fire has not to be brought to bear on forward slopes or against moving targets, cover should be so used that it affords a real protection, renders ranging difficult for the enemy's guns, allows of the Batteries being brought into position easily and without special preparations, enables the opening of fire to come as a surprise to the enemy, and preserves for oneself freedom of action. This procedure is of especial value when other batteries can at the same time bring fire to bear on the forward slopes." It must be acknowledged that such a use of cover must be dependent upon a large number of conditions, and cannot therefore be looked upon as a rule. The Reglement goes on "This regard for cover does not concern those batteries which are given the task of closely following the movements of their infantry (se lier aux mouvements de l'infanterie). In their case there should be no hesitation about coming into action in uncovered positions, although a battery under these circumstances may easily lose its power of manœuvre." Roucquerol, one of the best known French writers on Artillery matters, at the end of his excellent book "The Artillery in the battle of August 18th," declares himself unmistakably against the adoption of covered positions as a general rule.

The rule in Germany is that an Aiming Point is only made use of when firing from behind cover; otherwise the target itself is laid on direct. In France, on the other hand, the rule is to employ an Aiming Point, direct laying being the exception. The latter is only used when the target can be clearly seen in its full extent by the detachments and when it is very easy to point out; direct laying is as a rule, only used when firing at a moving target. This difference between the methods adopted in the two countries may very likely have given rise to the idea that the French contemplate firing from behind cover as the normal mode of procedure.

It is very probable, however, that this epidemic of cover seeking has not been introduced either from Russia or France, but that it has broken out of itself in Germany. Because batteries of heavy Field Howitzers managed to shoot from masked positions without much difficulty it was thought that all Field batteries should do the same thing. As a matter of fact, guns could fire from most howitzer positions; it is seldom that the flatter trajectory of the former would make it impossible, and even then a small change in position would get over the difficulty and allow the shell to clear the cover. The point to notice, however, is this:—

The conditions under which our Heavy Field Howitzer Batteries fight are just those conditions under which the French Reglement contemplates that fire from completely masked positions should be used. The targets would be stationary (entrenched positions, hamlets and perhaps batteries in position). Individual batteries may well be allowed to fire from these covered positions, but never the bulk of the available guns.

One must have a clear appreciation of the duty of Field Artillery in battle. Its whole object is to assist its infantry, which alone can produce decisive results. The principal target of the Artillery must therefore be the opposing Infantry —in attack or in defence—and the enemy's guns should only be engaged when they threaten the success of one's own Infantry.

The old idea of a set Artillery Duel before the advance of the attacking infantry has been generally abandoned since the introduction of gun shields. The Artillery of the attack can hardly hope to so completely silence that of the defence that a certain proportion of the latter will not be able to open an effective fire on the attacking Infantry.

Everything points to the necessity of Artillery and Infantry working in still closer harmony than before the advent of shields.

In order to secure this intimate co-operation the Artillery must be able to change from one target onto another rapidly, and I do not consider that this can be done when the guns are completely masked, in spite of the improvements in means of indirect laying.

Those who think than an Artillery duel – and that a decisive one—is still going

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to precede the Infantry advance, are, in my opinion, quite right in recommending covered positions for this duel.

There is no doubt that it takes a comparatively long time to open fire from masked positions. If the cover is low and the target can be seen by a man standing on a wagon or mounted on a horse, the approximate direction can be given to one gun without difficulty, as laid down in our Training Manual 231—2. If the cover is too high for this, the direction of the target can often be given to one gun by putting out Aiming Posts. This is a simple enough process, but it takes 5 or 10 minutes to carry out.

If, however, the direction of the target can only be given from a flank, the method used in the French Artillery must be adopted.

(Note by Translator:—

General Rohne here goes on to describe how the guns can be laid by the use of an Aiming Point in front, about as far off as the target, the B.C. on a flank giving out the necessary deflection as measured by his Director. He then considers the case when no such Aiming Point exists. The B.C. must then, he says, measure the angle known to us as T O B and send this to the guns which, with their sights set at this angle, lay on the B.C. and thus obtain a Line of Fire parallel to O T. He says that the error in direction due to the distance O B can easily be corrected after firing has commenced. He does not contemplate any calculation of displacement, nor the use of anything in the shape of a plotter. Where O cannot be seen from B he recommends the use of a compass, or rather of two compasses. In fact, the methods he describes strike one as very elementary and inaccurate, and I have not thought it worth while translating the somewhat long description.

After touching on the difficulty of simultaneous ranging by the batteries of a Brigade under these circumstances, even if there is some interval between the targets of the different batteries, he dwells upon the uncertainty as to whether the trajectory will clear the cover, and the necessity of placing a gun in action in order to ascertain this. He does not consider the possibility of the Battery Commander being able to find this out before the arrival of the Battery. I now resume the translation).

The greatest difficulty of firing from behind cover is to be found in the control of fire. If the Battery Commander can place himself where he can observe and command his battery at the same time, the problem is simple. But, if this cannot be done, the commander has a difficult choice before him. Either he must go to the Observing station, whence he can watch the effect of his fire and follow tactical developments, altering his target or rate of fire when necessary, or he must stay with his battery, for the behaviour of which he is responsible, and thus be able to bring his personal influence to bear upon his subordinates. The disadvantages of either course are so great that firing from behind cover should never be attempted when Observation and Fire Control cannot be carried out by one person.

I will however suppose for a moment that the Battery Commander has a very trustworthy and energetic First Lieutenant (Oberleutnant), to whom he can hand over the control of fire, and that he himself goes off to a distant point from which he can observe. It seems to me that there will be great difficulty in observation unless the Battery Commander can himself see the Battery and thus know without delay which gun fires. With Howitzers this is a simple matter, for the large bursting charge of the shell makes it easily distinguishable from other shell bursting near the target.

The next difficulty is that of communicating Observations or Orders to the Battery. For the former a simple code of signals would suffice, but the code should be clearly laid down in the Training Manual for the Artillery, otherwise confusion would be sure to occur, especially in newly formed units.

(Note by Translator:—

Control by sending "Observations" and not "Orders" has been tried in this country and is not in great favour).

If Orders are to be sent to the Battery, either a chain of orderlies to pass words of command, flag signalling, or finally telephones may be used.

The latter is the quickest means of communication, once it is established, but this is a somewhat lengthy process, and communication is rather easily interrupted.

Where Batteries are in action singly, the telephone may be used without much difficulty, but the idea of using them would have to be abandoned in a general action owing to the noise made by one's own guns and the enemy's shells. Since 1870—71, the number of guns has been doubled, the rate of fire has been very much increased, and the charges have become a good deal heavier. When we consider that even in those days orders had to be shouted into the ears of the gunners in order to be understood, how can it possibly be imagined that the fire of all batteries is going to be controlled by the telephone, the same instrument which only works satisfactorily in civilian business if one shuts oneself up in a noise-proof compartment? The transmission of orders by chains of orderlies or by flag signalling is slow, mistakes are very likely to occur.

In any case the possibility of communication between a Battery Commander and his Battery being broken must be guarded against. This means that the front allotted to each battery must be

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increased, possibly very largely, and also that much more room will be taken up by the Artillery as a whole than is the case when the 'half-covered' position is used. It will therefore be impracticable to place more than a small proportion of the Batteries in completely covered positions.

One of the greatest advantages of modern artillery is that, by means of its destructive rapid fire, fleeting opportunities can be seized. This advantage will be surrendered if we go in for covered positions, for one of its indispensable conditions is direct laying. A 'switch' from a covered position must always be rather an undertaking, even if it is only desired to bring a certain area of ground under fire. Angles have to be measured in every case, and, whilst this is being done, and the result communicated to the battery, the fleeting opportunity has probably fled. Shooting at moving targets is certainly possible, but, especially if the movement is not along the original line of fire, it will be very difficult to make effective.

The conclusion I come to is that positions should, as a rule, be so chosen that at least one gun of a battery can be layed on the target direct for line. It is better if all the guns can be so layed.

It would be a very good thing if every battery were provided with an Observation ladder long enough to bring the eye of a man standing on it to a height of 5 metres from the ground. This would often enable cover to be taken and at the same time permit of one officer carrying out the duties of control and observation.

For Field gun batteries positions from which the line of the target can be obtained direct must remain the rule; completely covered positions must be left to howitzers, for in their case the objections to such positions do not hold good.

The liking for covered positions is mainly due to fear of the effect which hostile Common Shell fire may produce on exposed batteries.

Direct hits are doubtless more dangerous than they were even in the war of 1870—71. They will also be more frequent against guns provided with shields than against others, for the shield increases the vulnerable area. The effect of direct hits will be greater, for, whereas in the old days a shell hitting a wheel might disable that wheel, whilst the shell itself did not explode until it had passed the gun, and therefore did not hit the detachment, nowadays, when common shells are filled with a High Explosive, not the wheel only, but probably the gun and the whole detachment would be put out of action.

It will be seen that I do not attempt to discredit the effect of direct hits, but I maintain that one must not allow one's own fire effect to suffer in attempting to avoid them. We must bear in mind that, at the long ranges of modern Artillery, and against guns which are very difficult to see, direct hits will very seldom be obtained, and the harder it is to find the range, the less often will such hits be made.

I would not inflict probability calculations upon my readers, had not a claim been made in an article entitled "Verdeckt oder offen" Militar-Wochenblatt, 430, 1907), that all six guns of a battery on a crest could be struck by direct hits with an expenditure of 400 rounds of percussion shell.

Let us investigate this claim more closely.

A gun with a shield is about 1·8 ms. high, and 1·5 ms. broad. The Krupp 7·5 cm. Q.F. Field gun L/30, which may be taken as a fair type of the modern gun, has, at the range in question, a 50% height Zone of 3·8 ms. and a 50% breadth Zone of 2·1 ms. Under these conditions it would be possible, provided that elevation and line were exactly found, to obtain 9 hits per cent. At ordinary peace practice these Zones are at least doubled, and in war time they will certainly be at least three times as great. This would mean a reduction of the percentage to 2·4 for for peace practice and to 1·05 for war. Now anyone who has been present even once at experimental firing knows that it is extraordinarily difficult to bring the mean point of burst onto the centre of the target, even when the ranging is carried out with a single gun, and when the actual result of each round is telephoned up to the firing point from the target. When, however, the 'Dispersion' is greater, and when one is entirely dependent upon one's own observations from the firing point, it may be considered an exceptionally good result if the mean point of burst is within 75 ms. for elevation, or within 5 ms. for direction of the centre of the target.

Under such conditions the probable percentage of hits falls from 1·05 to about ·4, in other words, that it would take not 400, but 1,500 rounds to get 6 direct hits.

Even this result is not likely to be attained, for a considerable number of shots are sure to be unobserved, whilst it will be almost impossible to correctly judge the position of a burst with reference to a battery which is only disclosed by the flashes of its guns when they are fired.

As a matter of fact a searching fire would have to be used as a rule if any effect is to be hoped for against a Battery only disclosed by the flashes of its guns. If the 400 metre bracket can be found, and the 100 metre front of the hostile battery accurately located, an area of ground measuring about 50,000 square metres will have to be brought under fire. To shells falling with an angle of descent of 8 deg. 24 min. the horizontal surface exposed by a gun is about 6·8 times as great as the vertical surface, or about 18 square metres. That of a battery would therefore be about 110 sq. s.

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450 rounds would be required to drop a shell into this space (i.e. 50,000 divided by 110). In order to hit all six guns 2,700 rounds would be required, provided that the 400 metre bracket was accurately established, and the distribution correctly and evenly made both laterally and in depth. We can realise what this means if we consider that, including in the reckoning the light ammunition column, a battery does not possess 200 Common Shell, and has only 1,132 rounds altogether. We may assume, therefore that even if the batteries are equipped with a projectile which is effective against shielded guns—High Explosive Shrapnel, combined Common and Shrapnel, or whatever form it may take—and if direct hits on wagons are assumed to be as destructive as those on the guns the position on the crest is not so dangerous as it is often made out to be.

My efforts are only directed against attempts to make Covered Positions he rule for Field Artillery. To do thi' would be to commit as great and dangerous an error as when it was thought, in 1866, that rifled guns could support the Infantry at least as well from positions far in rear as they could by advancing to closer ranges; an idea which was exploded by the complete failure of the Prussian Artillery. It seems to me that this fact should now be recalled for the benefit of the younger generation which has no personal recollection of it.

The Field gun has, in its shield, an amply sufficient means of protection. We may justly expect of the Field Artillery that the old Artillery motto will be acted up to—"Effect before Cover."

Infantry Fire against Shield Protected Batteries.

Précis from the German by Lieut. V. Drouart.

A Précis

of an Article in Part IX., 1906, *Kriegstechnische Zeitschrift*.

By LIEUT. A. F. P. WEHNER, R.G.A.

When considering the employment of infantry fire against shield protected batteries the problem which confronts us is:

What effect may we expect from infantry fire when attacking shield protected batteries, and is it advisable to introduce a more effective bullet with a higher penetrating power?

At the present time most of the great powers are rearming their artillery with shield-protected long recoil guns (*e.g.*, our 13 pr. and 18 pr. Q.F.). These present to the infantry a target of much greater resisting power, and means will have to be devised for combating the difficulty.

Oblique and enfilade fire are recommended as being the most likely to give good effect against batteries in action.

The following remarks show to what extent the Germans are capable of bringing effective fire to bear on shield-protected batteries with their present small arm ammunition.

Experiments have been carried out at Krupp's and Ehrhardt's Works to test the penetration of modern rifle bullets through steel shields. They employed the ordinary service bullet (hard envelope and soft core), all steel and steel-cored bullets of calibres of ·256" and ·311".

The results proved that steel plates ⅛ inch thick were sufficient to give cover against the ordinary service bullet at a range greater than 380 yards.

The effect of the all-steel bullet was rather better, but the steel-cored bullet was the most effective of the three.

The latest Krupp shields made of special steel, ¼ inch thick, will resist the most modern rifle bullets at the closest range.

Nothing very definite as to the new S bullet 98 and shields is given in the German musketry instructions for 1905.

From the above remarks it appears, that at any range beyond 500 yards fire from even the latest pattern rifle is practically useless against shields ⅛ inch thick.

If it is desired to obtain penetration recourse will have to be taken to all-steel and steel-cored bullets.

Artillery objectives will not frequently present themselves to infantry at ranges below 1,000 yards, and therefore special bullets of the above mentioned type would have to be introduced to penetrate shields at that range. The ordinary rifle however, is not capable of firing such projectiles with the required velocity to ensure penetration at such a range.

If we are content however with gaining a partial success at closer ranges with special projectiles for our present rifle, this can only be effected on account of the good ballistic qualities of the present small arm ammunition.

Hence it is apparent that generally it will not be worth while to waste ammunition on a shield-protected battery in action, when it might be much more usefully employed against the enemy's infantry.

It will only comparatively seldom occur that infantry will be able to occupy positions from which they can bring oblique or enfilade fire to bear on a battery in action. It will therefore be better to leave the hostile artillery to one's own guns and to look upon them only as an occasional objective.

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Proposed increase of the French Artillery.

Translated from the "Revue d'Artillerie," for December, 1906

By COLONEL A. H. C. PHILLPOTTS, LATE R.A.

The following lines are extracted from a speech of M. Messimy (Deputy) on the War Budget for 1907, drawing attention to the ever increasing importance of the Artillery arm, and the numerical inferiority of the French Artillery as compared with that of other countries and the necessity for remedying this deficiency in numbers:—

All the documents, all the notes which the Department of War has furnished this year agree in urging the necessity of an important increase of our Field Artillery.

Is this increase then urgent and necessary?

The Rôle of Artillery in the Russo-Japanese War.

Although the secrets of the war in Manchuria are not yet completely known in all their detail, the physiognomy of most of the battles shows that the importance of the Artillery arm has considerably increased. The actors in the struggle were all impressed by the effect of modern artillery. "One gets very soon accustomed to infantry fire," says Captain Soloviev, "but artillery fire produces a marked impression; on those unaccustomed to war, it is the explosive shell which produces the most marked impression; on those inured to war it is the shrapnel.

It is absolutely impossible to pass over the fire swept artillery zone in the open, not only in column but even in deployed formation, under the fire of modern artillery.

The proportion of artillery in the Russian army was considerably inferior to that of the Japanese army. The Russian artillery also often had the worst of it in the early battles, and besides the disproportion of the total forces engaged, it was to this latter to a considerable extent that the really decisive results obtained by the Japanese in the first encounters were greatly attributed.

At the Yalou (1st May, 1904), the Japanese under Kuroki deployed 72 field guns and 12 large calibre guns against 24 guns of General Sassoulitch.

After an artillery fire which lasted till the evening, General Kuroki gave the order to assault. At 9 o'clock the Japanese were masters of the first Russian line, the fight had lasted less than two hours, and had cost them about 600 men.

To the excellence of the artillery preparation, and to the intimate co-operation of the two arms during the march to the front must be attributed the small losses suffered by the Japanese, notwithstanding the density of their attack formation.

M. von Gottberg, correspondent of the Lokal Anzeiger, an eye witness, says on the subject: "The frontal attack was almost entirely supported by artillery fire. There were in front of it 4,000 rifles who fired more than 400,000 rounds in half an hour, which numbers had little to do with the loss of 600 men. The extraordinary inefficiency of the infantry fire was easily explained by any spectator who was aware of the accurate and truly infernal fire of the Japanese artillery."

At Vafangou (14 to 15 January, 1904), the 1st Siberin Corps had 29 battalions and 10 batteries (80 guns), the Japanese had 400,000 men and 216 guns. The superiority of the latter in artillery was therefore considerable.

On the morning of the 15th, the Russian batteries as soon as they had opened fire were opposed by the Japanese artillery firing with remarkable accuracy. The Russian artillery while trying to change its position in front of the enemy found itself fired upon by the Japanese artillery, which concentrated its fire successively on each of the Russian batteries as soon as

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they opened fire. In 20 minutes these latter were almost annihilated. From now on, the infantry fight and the retreat became extremely murderous for the Russians, who lost 130 officers and 3,500 men, while the Japanese only acknowledge a loss of 51 officers and 1,160 men. This disparity in losses was attributed by all eye-witnesses to the numerical superiority of the Japanese artillery, and to its judicious tactical employment.

After Liao-Yang, the effective of the Russian army commenced very considerably to exceed that of the Japanese; but despite their small proportion of artillery they were able to bring into line a larger total of guns than the Japanese.

In general, the Japanese artillery, not withstanding this, obtained a superiority over the Russian artillery because the latter nearly always keep some of their batteries in reserve instead of engaging them all at the commencement like the Japanese. And also because the Japanese who had been accustomed for several years to the service of their guns employed them more skilfully than the Russians who only became acquainted with their new gun for the first time while on the march.

Numerous episodes show that a frontal attack, however energetically carried on may fail if the defender is not crushed by artillery fire.

At the battle of Nanchan (25th May. 1904), which was fought after the disembarkation of the 2nd Japanese army, and the result of which was the isolation of Port Arthur, the attack of the 4th Japanese division commenced at 6 in the morning by a violent cannonade of the divisional artillery, whilst four gun boats brought up broadside on in the Bay of Kintchéou brought their guns to bear on the reverse of the Russian position.

At 9 o'clock, General Oku, judging wrongly that the artillery preparation was sufficient, led his three divisions forward. The attack completely failed, the fourth division stopped at 400 métres, and found itself in a very critical position because low tide compelled the gun boats to draw off temporarily. At 3 o'clock, their return allowed fresh progress to be made with the attack, but the preparation by artillery fire was still insufficient, and at 5 o'clock the Japanese attack was driven back all along the line.

It was then, only after enormous losses (5 officers and 713 men killed, 100 officers and 3,466 men wounded), and thanks to a turning movement of the 4th division, marching in the water close to the Bay of Kintchéou and taking advantage of the dead angles to reach their left flank, that the Russians were forced to retire, being uncertain of their line of communications.

At Da—Tchi—Tsiao (24th July, 1904), the Japanese at nightfall hurled their infantry into the attack of the Liaoutsoutchaï position.

Despite an enormous consumption of ammunition, the artillery preparation counted for nought because the Russian infantry did not occupy the trenches the Japanese had been firing at. The attack was repelled by a vigorous counter-attack. A second and even a third assault delivered respectively at 9.30 and at 10 o'clock in the evening with no greater success.

At Liao-Yang on the 1st September, the Russian regiment No. 37 was attacked in its position by the Japanese. These latter got so close up to the Russian trenches that after the fight 30 Japanese bodies were picked up at 15 métres, and 580 bodies at 100 métres from the trenches. Nevertheless, the attack failed because the defenders not having suffered from the artillery fire, remained cool.

The Russian losses were only 6 officers and 300 men, 54 being killed.

To resume, the Japanese successes were more or less decisive according as their artillery were able to more or less rapidly overcome the enemy's artillery. When they were able to attain this result either by reason of their numerical superiority, as at the opening of the war, or by reason of the superior employment of their artillery, the fight became decisive as at the Yalou and at Vafangoou.

When they were not able to attain this result their attacks failed or else only succeeded at the cost of enormous losses as at Nanchan, at Tachekiao, and in the numerous fruitless assaults attempted at Liao-Yang, at Châ-Ho, and at Moukden.

According to the testimony of all eye-witnesses, the gun was one of the principal factors in the victory of the Sons of the Rising Sun.

Artillery in foreign armies.

Faithful to the idea that it is not by the power of numbers that in the next war victory will be seized, we have not endeavoured to establish as a basis what is the absolute number of guns in line in the big European armies. We merely asked ourselves what is the proportion of guns in each army per thousand men. The result is not in our favor, for Italy and Austria alone have a smaller proportion than we, in England and Germany the proportion is greater.

France puts into line 3·3 guns per thousand men.

England 5 guns per thousand.

Germany 5·2 guns per thousand.

The German Army Corps opposes to our 92 guns (23 batteries of 4 Q.F. 75 mm. guns), 144 guns (24 batteries of 6 guns).

The two matériels are of nearly similar power. The German gun, model 1896, which was most disappointing has been completely remodelled. The altered weapon fires exactly the same ammunition as the preceding, but as regards rapidity and accuracy of fire it is similar to our 75 mm. gun.

More than a third of the German Army Corps, and especially all those of the valley of the Rhine have the new gun in their possession at the present moment.

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Within eighteen months from now there will not probably be any weapons of the old model in the hands of the German army.

Is it necessary for us to have in our Army Corps as many guns as our prospective enemies? Would it be good to have more? At first sight the answer to these two questions would be in the affirmative. They deserve, however, to claim our attention for a moment. It is not really absolutely correct, at least within certain limits, that when it is a question of Q.F. artillery, the more guns we have, the stronger we are. What is of more importance than the number of guns, is the number of rounds available on the field of battle. We know that a battery firing on the field of battle without stopping will empty all its wagons in less than two hours. The first steps therefore to take on the adoption af a Q.F. gun is to increase very considerably the number of rounds carried with the army, or which are ready in the magazines at the base to be brought to the front.

"The Q.F. gun," said one of our Generals, is an animal terribly greedy "of ammunition." What would be "thought of a commandant of a place "which was being besieged, who, having "scarcely anything on which to feed his "defenders, would enroll others without "making arrangements to get in a corres-"ponding amount of food for them? If "we have not enough ammunition to "give our 75 mm. guns to consume within "a reasonable time, they will become use-"less mouths, heavy impedimenta."

We have been many years in realising completely what the ammunition supply of our gross feeder of projectiles" means.

It is important to remember that with modern artillery the amount of ammunition with an army is of very much greater importance than that of the guns themselves.

With the above reservation, it is just as evident, that on condition that the new matériel has a sufficient supply of ammunition for its formidable "appetite," our Army Corps will receive a tremendous increase of strength if the total number of guns is increased. Perhaps it is not necessary to go as far as 144 guns which our neighbours have adopted, but 130 seems to be a number below which we should not go. If we adopt the number selected by the Germans we shall have to add 52 guns to each of our Army Corps, if, however, we select the lowest standard, we should have to add only 38 guns to an Army Corps. This means for our 20 Army Corps an increase of 1,000 guns in the first case, and rather less than 800 in the latter case.

Should the Battery have 4 guns or 6?

Two methods are open to us.

We could add two guns to our batteries which at present have only 4 guns each since the 75 mm. gun was adopted. They will thus be armed with 6 guns as was all our Artillery at the time we had the de Bange 90 mm. gun, and like all the German batteries at the present time. Or else, we can keep the 4 gun battery armament and create 200 or 250 new batteries.

The first solution would appear at first sight to be the better one, for it is economical as requiring a smaller number of cadres.

It is also simple since it means a return to a state of things which was only recently in existence.

All French artillerists, and more especially those who we are certain would not allow personal considerations or rapid promotion to influence them are unanimous on this point. They insist on keeping the 4 gun battery, as being simpler, more flexible, and more efficient than the larger unit. After reading current German literature on the subject we find that they have come to a similar conclusion across the Voeges.

We do not here pretend to decide a question, the solution of which is essentially technical. But there is no doubt that the officers of artillery are unanimous in insisting on the retention of the 4 gun batteries as enabling the most to be got out of this important arm of the service.

As regards the new heavy batteries for the field, these should consist of 2 guns only with a very large number of wagons, and other carriages, and a very important staff. Great care must be taken not to divert this necessary heavy artillery from its proper functions and convert it into a siege artillery.

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2. *Vol. XXXIV.*

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2. *Vol. XXXIV.*

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VOL. XXXIV.

CONTENTS.

The Limitations of the DIVING SUBMARINE.

By Robert G. Skerrett, Esq.

Reprinted from
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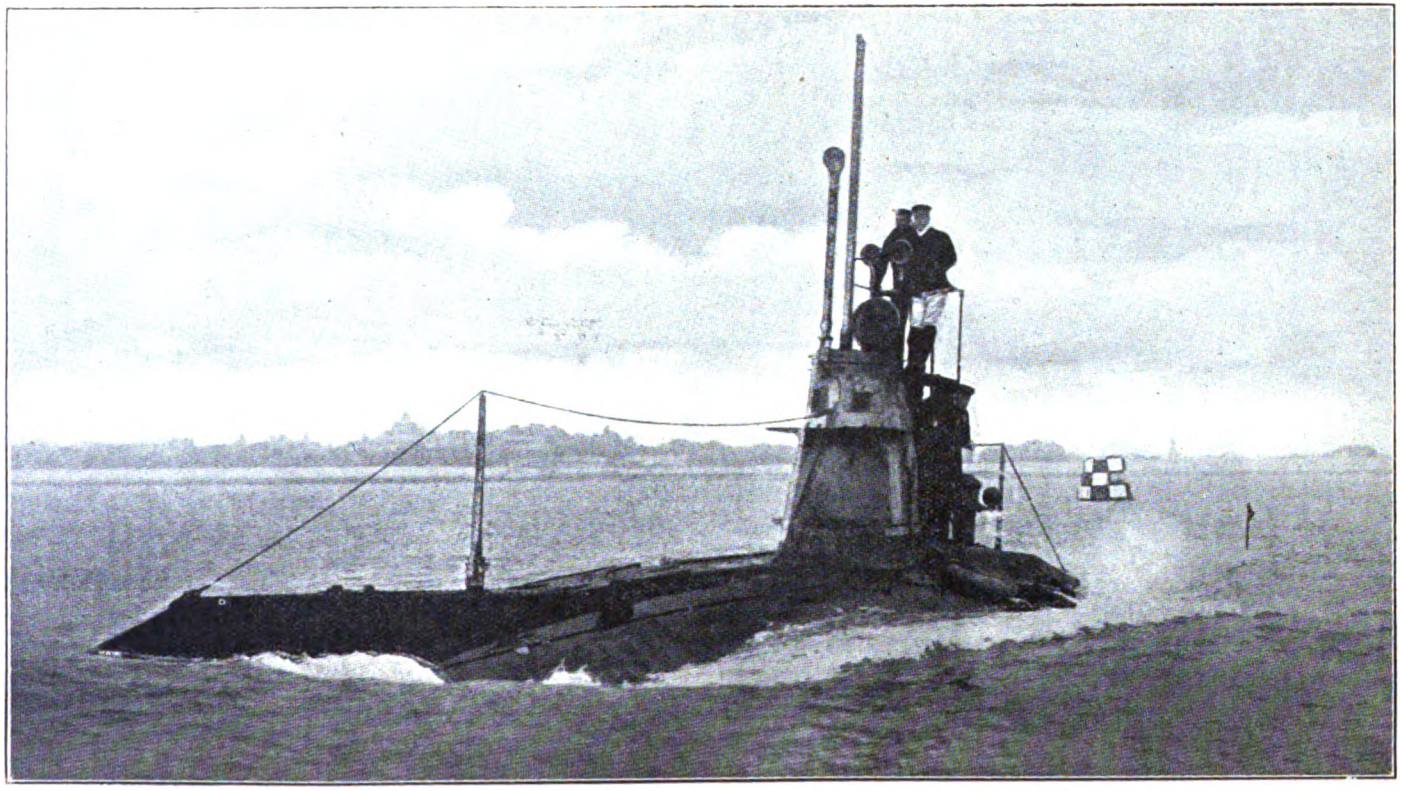

—*Photo by Stephen Cribb, Southsea.*

New British Submarine "A 12."

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The Limitations of the Diving Submarine,

By ROBERT G. SKERRETT, Esq.

WHATEVER may have been the professional opinion of the diving submarine ten years ago—much of which was then founded upon theoretical speculation—practical work with boats of this type within the past three or four years has emphasized certain characteristic weaknesses essentially inherent and impossible of substantial modification.

It served a very useful purpose some few years back to surround the building of submarine vessels with an atmosphere of exaggerated secrecy, and for business reasons a halo of mystery of wonderful things accomplished was further added to the commercial submarine in order to induce purchase preliminary to the disclosure of their real inner workings. How long success might have fostered this secrecy is a matter for speculation alone, but the train of accidents that has followed so closely upon the first serious attempts to try these vessels under conditions approximating even remotely the circumstances of actual conflict has subjected the science of submarine navigation to the dispassionate light of pretty thorough scientific investigation. Men of world-wide repute,—free from the slightest charge of commercial interest,—have taken these accidents to heart. They have seriously considered the submarine in a spirit of encouragement, but yet with an earnest desire to ferret out their weaknesses, to assist to the utmost in their practical developement, and to insure to the brave men that man them the maximum of immunity from hazard while still retaining in the craft the greatest measure of military efficiency.

The modern storage battery and the modern explosive engine have made the present submarine possible. So far, this dual installation of power has been necessary in order to secure the widest ranges of offensive usefulness. For propulsion upon the surface, where conditions permit the free induction of atmospheric air, the explosive engine is the most economical means of propulsion; but when running totally submerged the storage battery is the only present practical source of energy. As is common knowledge to every engineer interested in the development of the submarine, per unit of horse-power the electrical instillation is at least thirty times heavier than that of an efficient installation of explosive engines. As a natural result, every effort has been made to limit the period in which recourse must be had to electrical propulsion, while widening at the same time, the ranges of part submergence under which the submarine could be safely driven by explosive engines. A vessel that could run safely under engine propulsion while yet exposing

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above the surface only her conning-tower naturally would have a great advantage over a submarine boat capable of working in similar trim only under electrical impulse, because the radius of action when drawing upon the reserve of liquid fuel is many times greater than when depending alone upon the limited capacities of the very heavy accumulators. To this end, then, the boats now on the active list in the American navy—the first commercial submarines built for military purposes in the United States—were designed to run under their gasoelne engines both in the "light" and "awash" conditions; the latter trim meaning in the contract for those vessels a degree of part submergence only one very short step removed from readiness for instant submergence—that is, with a reserve of buoyancy of probably not much more than a thousand pounds. Such were the expectations and the contract promises. Limitations peculiar to the type made attempt so to perform too hazardous, and as the physical conditions that imposed that denial of fulfilment of contract are as present to-day as they were when the Adder and class were contracted for, it will be instructive to follow the performances of those American vessels.

In 1901, the Fulton—a type-mate of the Adder—was put in commission and expernimentally run in the sheltered waters of Peconic Bay. That vessel was built as a trial craft for the group of six vessels ordered by the United States Government in 1900. As a result of the performances of the Fulton, Mr. Lewis Nixon—acting on behalf of the Company holding the Government contract for the Adder and class—asked the Navy Department to make some radical modifications in the requirements for the acceptance trials of that group of vessels. That request was made agreeably to certain discoveries regarding the tendency of the Fulton to plunge or dive suddenly when trimmed in conditions of part submergence. Just what this meant can best be gathered by quoting from the "New York Herald" of December 12, 1901, in which is the following:—

Mr. Nixon in a letter to Lieutenant W. C. Herbert, Inspector of Machinery at his yard, which was considered to-day by the board of construction, states that in building the Fulton, every opportunity was offered to consult the navy officers of this and other governments, and he found it the universal opinion that different tests would better demonstrate the value of the vessel to the Government.

"Regarding the surface run, he says, *he* [Nixon] understands the contract to mean a trial run of ten nautical miles at eight knots. The consumption of fuel at this speed to be such as to give, with the total fuel allowance, a minimum endurance of twelve hours. Mr. Nixon believes this will cover the seven knots surface speed required by the contract. The Board of Construction refused to assent to such an interpretation.

"Running the submerged boat awash *has heretofore been regarded as of the utmost importance.* With all ventilators removed and only the conning-tower open, it has been held that it is possible for the boat to keep out of sight of the enemy, and also in condition to dive instantly. Mr. Nixon says:—

'We recommend that this run be at such trim as will permit the *safe* use of the gasolene engine. Under this trim all the ventilators must be rigged out and *there must be no danger of an unexpected dive,* either from a mistake on the part of the crew or from *unforeseen exterior circumstances,* such as passing over a bar or into a sudden swell.'

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"Mr. Nixon adds that *personally* he does not see any advantage in the awash run and thinks it should be eliminated from the trial. In this condition, he says, she makes practically as much disturbance in the water as when light, and *cannot* dive instantly to avoid attack . . . . Regarding the submerged runs, Mr. Nixon says the speed of seven knots required, necessitated deep water, while the trim desirable for this speed was undesirable for six knots, a speed suitable for water shallow as found *in* most harbours. If the speed were reduced to six knots, he offered a reduction of the permissible duration of appearance from one minute to thirty seconds."

There is a wealth of information in the foregoing extract and much is expressed and much implied that tells of the weaknesses peculiar to the "diving" boat. Could these facts only have been realized some years ago the loss of life and the grave risks run since might well have been avoided. It will be seen that the Fulton showed a tendency to dive suddenly when operating in a "true awash" condition, and to avoid the risks necessarily encountered with ventilators up, conning-tower hatch open, and gasolene engines running at that trim, Mr. Nixon reasonably proposed to eliminate this feature—of such military importance, if *possible* of accomplishment—from the schedule of official trials. For the same reason that there was still a risk run when the boat was totally submerged, he also proposed that the speed should be cut down from seven knots to six knots in order that the vessels might be run *in harbour* in relatively shallow waters. In shallow waters, naturally the craft would have to be run—in order to expose only a limited length of sighting-instrument—only a short distance above the bottom; and everyone is familiar with the tendency to " drag " or " draw " to the bottom under such circumstances. The ease of control of the " diving boat " grows in direct ratio as you reduce the reserve of buoyancy at any given speed. Therefore, to control a boat of the diving type at six knots she must have less reserve of buoyancy than needful for the same facility of handling at seven knots. As you increase the reserve of buoyancy in a "diving" boat you also augment the angle of dip at the bow that the vessel must maintain, at any given speed, in order to secure a balance between the lifting moment of the reserve buoyancy and the combined action of the forward thrust of the screw and the downward force of the diving rudder. In other words, the forward course of the vessel instead of being in line with the axis of the boat is at an angle to it, and the boat moves ahead in a plane parallel to the surface but with the bow of the vessel pointed several degrees downward. This angle, of course, would be greater at seven knots than at six, and any accidental circumstance that might add to this downward angle, especially in shallow water, would engender risks in the ratio of 7 to 6 in the case under discussion. Very reasonably, then, Mr. Nixon wished to increase his margin of safety by this liberal percentage. It will also be observed that Mr. Nixon did not consided those vessels in the light of offensive harbour-defence craft, but looked upon them as boats to be used only *within* harbours—an assumption quite at variance with the opinion of the naval authorities and the promises previously made to secure consideration for the type. How-

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ever, Mr. Nixon's fears for the safety of the vessels if run in the "true awash" condition under engines, as promised by the contract, were well grounded. That there were ever-present dangers constituting a serious menance to the lives of the crews so influenced the Navy Department as to lead to a modification of the permissible trim of the boats under the strict and legitimate interpretation of the term "awash" as understood by the contract. Not one of the Adder class was ever tried in the "true awash" condition under gasolene engines. Lieutenant William R. White, U.S.N., in describing the official trials of the Adder and Moccasin thus explains the "awash" condition as it was understood at the time those vessels were tried in Peconic Bay:—

"Awash, *improperly so called*, propelled by the gasolene engines, trimmed for diving, *except* that the main ballast tank was empty and the conning-tower hatch cover was kept open, but with everything else in readiness for commencing submerged work."

The difference between the reserve buoyancy in this much-lightened "awash" condition and the "true awash" condition was a matter of *more than fourteen tons*, and a very considerable period was required to bring the boat from this trim to a condition of readyness to dive. The loss in military efficiency is thus strongly emphasized, and it becomes evident that when operating in the neighbourhood of a foe, boats of this type must have recourse to electrical propulsion and be subject to all the limitations that that imposes.

The tendency of the diving boats to "draw" bottom when working in relatively moderate depths—a feature very marked in vessels of the Adder type, was described by Lieutenant White in his paper in the "Journal of the American Society of Naval Engineers," printed in 1903. Lieutenant White said:—

"At one time during the 3-hour submerged run of the Adder, the boat touched the *sandy* bottom in a depth of about 29 feet and would not answer the diving rudder. Ordinarily, when submerged and under way, this rudder is maintained at an angle of 9 degrees. On touching bottom it was shifted to 18 degrees in the opposite direction without effect.

"In order to change the trim of the boat and put her down by the stern, 2 men were sent aft, still without effecting the release of the boat. Then the motor was slowed slightly and the main ballast tank was blown out. The force of the expulsion of water, with the additional buoyancy thereby gained, freed the boat and the Adder rose to the surface. . . . ."

The result might have been quite serious for the submarine *if the bottom had been of a clay formation*. The kinetic energy of such a large mass at 7 knots speed, might, under proper conditions, be such as partially to embed a boat so that the suction would make it a very difficult matter to free her. There would then be, of course, the weight of the column of water as well as the atmospheric pressure tending to hold the submarine to the bottom, against which combination the reserve buoyancy and that gained by expelling water from the ballast and trimming tank might be of little avail."

The dangers of touching bottom have been further officially

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recognized, and this is what the report upon the acceptance trials of the U.S. submarine torpedo-boat Adder has to say upon this point:—

"The influence of the proximity of the bottom, when the vessel is running submerged in shallow water, is very marked and may produce very serious disturbances if she is not properly handled. It is evident that the forces due to the reaction of the bottom of the vessel when scraping the ground when running submerged, *are very large in comparison with those developed by the diving rudder*; and might result in serious accident in the case of actually touching the bottom, unless good judgment were used in slowing down the electric motor,—and, if necessary, blowing water out of the ballast tanks and shifting men in the boat in order to clear the vessel of the bottom.

Such an accident occurred during the 3-hour submerged run of the Adder, the boat hanging for about 30 seconds at a depth of about 19 feet, with 10 degrees trim by the head and with the diving rudder brought over to 18 degrees 'rise' (as far as it could go), *the vessel still increasing trim by the head and depth during this half minute.*"

The boat was drawn to the bottom by "drag" acting upon her lowest point—her bow, her diving rudder being powerless to check that force, and the vessel continued persistently to follow the contour of the hard, sandy bottom as the depth and dip of the water-bed increased. By slowing down the motor, blowing out ballast, and shifting men, contact was broken and headway checked before hitting an obstacle or assuming a dangerous angle. It was nerve-wracking while it lasted.

The illustration (Fig. 1) shows what might happen to a submarine vessel even when embedded only to a moderate extent. The maximum angle assumed, that of forty degrees, is based upon the testimony of Lieutenant Godfrey Herbert of the British navy after the sudden sinking of the A 4—a vessel of 200 tons submerged displacement. That vessel dived and attained an angle of forty degrees by the head, she reached a depth of at least 90 feet—her gauges could register no more—and was then brought to the surface by the exercise of wonderful presence of mind before the boat probably touched bottom. The boat simply sank—she had no headway.

Mr. Leo Morgan, in the "Journal of the American Society of Engineers," for 1903, described the official acceptance trials of the Grampus and Pike; and this is what he had to say of the tendency of the boats to dive suddenly and the need of a continual "rise" to the diving rudder to counteract this impulse:—

"In getting up to full speed in either the light or the awash conditions, the trim of the submarine is varied by command of the captain to suit the conditions of the sea, sometimes the diving rudders being shifted gradually as much as four degrees.

"In the *lightest* condition the reserve buoyancy of the submarine is quite small, and while under the gasolene engine the conning-tower hatch must be left off to supply air for the engine; *should the man at the diving wheel make a mistake in handling his helm, or should he lose his nerve, the boat might easily—in fact too easily—take a downward plunge.*"

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The maximum reserve of buoyancy of a 200 ton submarine in light condition could not exceed 20 tons.

The chances of release from bottom even if no water had entered the boat and all tanks could be pumped empty, would be:—

White space, buoyancy.

Black space, hydrostatic and atmospheric pressures combined tending to hold boat down.

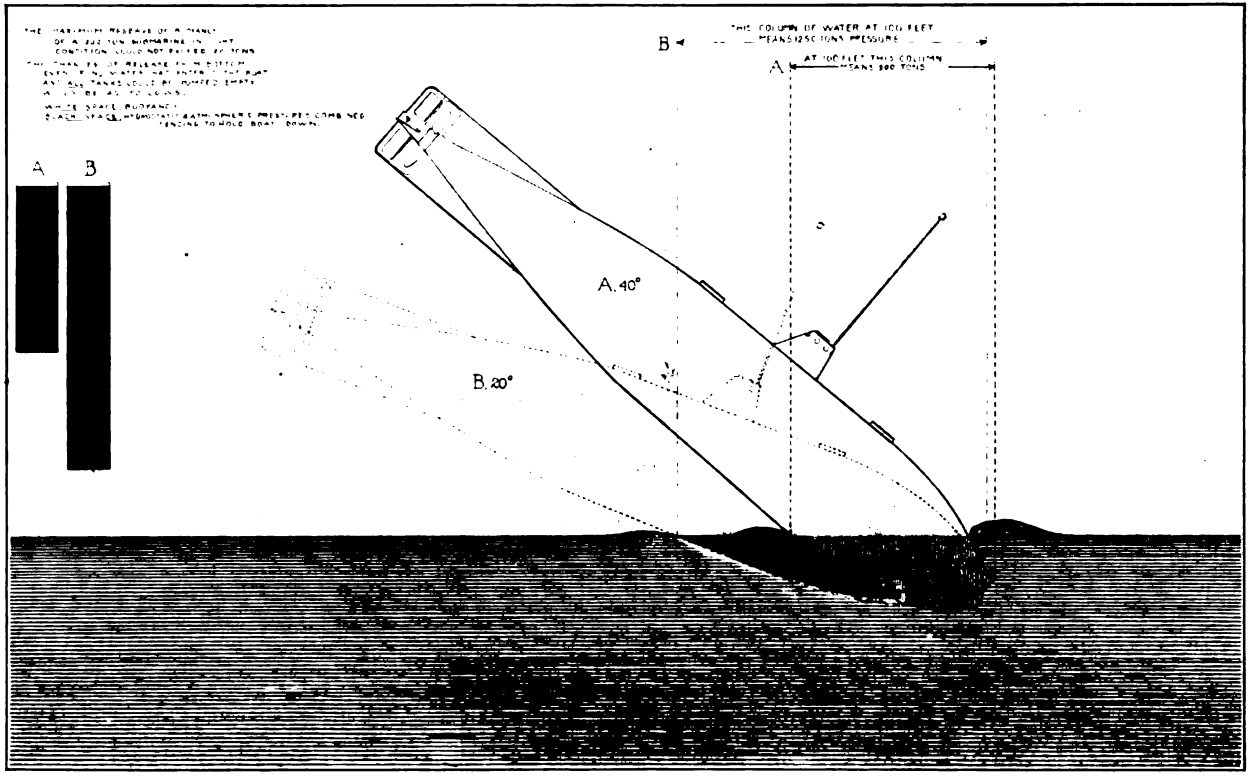

Fig. 1. One of the perils of the diving submarine and the limited self-contained chances of release. The craft in question is assumed to be of 200 tons submerged displacement with a reserve buoyancy of only 800 pounds when in diving trim.

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The loss of the A8 bore out with distressing emphasis what Mr. Morgan had described more than two years before.

In 1902, during the hearings before the Committee on Naval Affairs, U.S. House of Representatives, Ensign C. P. Nelson gave some testimony in regard to the manner of handling the Fulton and the Holland. As Mr. Nelson had been associated with both of these vessels at that time—May, 1902—his testimony in regard to the working principle of that type of boat may be accepted as based upon personal experience. Mr. Nelson said:—

"The boat, as I say, is put in a position of very slight stability, longitudinal stability, and in that way she is just like she was hung by the centre of gravity. The centre of buoyancy is above the centre of gravity, considerably above it, and the nearer you get her completely submerged the bigger rocking arm you have, so that when she is submerged she has more stability in an *athwartships direction*, and her centre of buoyancy and centre of gravity are almost directly over one another in a vertical line so that the boat will tip up either way *on very slight provocation.*"

In July of 1904, Mr. Nelson, then a Lieutenant, made some diving experiments with the U.S. submarine Porpoise in the sheltered waters of Narragansett Bay. This is, in part, the result:—

"Having noticed frequently that while running on the surface in diving trim, the boat's *natural tendency was very strong to dive of her own accord and considerable rising helm was required to hold her bow up*—in order to find out whether or not she would assume a dangerous angle if allowed to follow this tendency, we put the diving helm at zero (standing by to give a hard rise if her angle became too great); she took an angle of seven degrees and very rapidly went down, the angle then increased very slowly up to eight and a half to nine degrees where it remained until she was down about fifteen feet by the guage when she suddenly started to right herslf and rose to the surface at an angle of about six or seven degrees. When to the surface she dived again, making as good a porpoise dive as could have been made with the helm; she continued making these dives one after another until stopped by the helm."

Had the boat been running then under gasolene engines and in the "true awash" condition as contemplated in the contract under which she was built—which, as there understood, meant readiness for instant diving—it is perfectly plain to see what would have been the result with ventilators up and open and the conning-tower hatch cover lifted to provide the air necessary for the engines. It would have been another case of the A8. Again, had the boat at that time been running in waters of about thirty feet in depth and over a thick mud or clay bottom, plunges of that sort might easily have proved disastrous, especially if the diving rudder had been set to "dive" instead of being fixed at zero as Mr. Nelson reported. Mr. Nelson further stated that additional experiments showed the ranges of these voluntary dives to depend entirely upon the trim of the vessel at the time. Any sudden shifting of weights or additional trim forward would seriously affect the results. At the time of those trials, the Porpoise had a trim by the head of one and a half degrees, which,

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Mr. Nelson stated, was " her best trim for handling under water as found by repeated trials." That meant, of course, a certain amount of ballast in the forward trimming tank in order to effect that *permanent* inclination by the bow.

There is another aspect to the difficulties of controlling boats of the diving type when running submerged. These difficulties are not susceptible of easy mastery. In 1903, the Shark, the eighth submarine tested for the United States Navy, and the ninth boat of that type built and run in the United States under the direction of one man especially expert in their control, was selected by the Board of Inspection and Survey of the United States Navy for the 3-hour endurance test submerged—that vessel representing in that trial the two other boats submitted at the same time for official examination, *i.e.* the Plunger and Porpoise. The official report upon that trial reads as follows:—

"It was decided previous to the trial that owing to the haziness of the weather and the difficulty in seeing the landmarks, the person in charge of the vessel might remain above water sufficiently long at each appearance to avoid endangering his boat. It will be seen, however, in the record of the different appearances of the boat on the surface, during the whole trial it was on the surface for a period of *nearly an hour*, and the board is of the opinion that this was not entirely due to the difficulties of navigation, but in several instances to the bad balancing of the boat which made it very *difficult to submerge again* after coming to the surface."

Lieutenant Daniel S. Mahoney in his article in the " Journal of

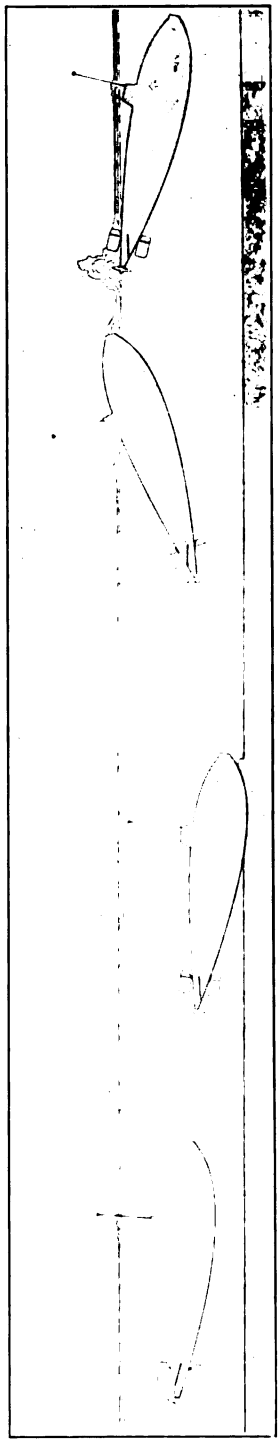

Fig. 2. Positions during diving operations in 30 feet of water of U.S. submarines from official records of performance. There is only one of these positions in which a torpedo might be fired with any chance of success. In the other positions the boats have either invited destruction by collision with the bottom or have so exposed themselves upon the surface as either to warn an enemy or to invite destruction by gun fire. It will be noted especially that when the boats are running with only a short section of the sighting instrument above the surface, the margin between their keels and the bottom does not give more than 5 or 6 feet of leeway in a vertical direction.

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the American Society of Naval Engineers," for August of 1903, says:—

"Observers on the tug stated that the Shark was trimmed for this trial with an excessive buoyancy, and that *she shot up like a porpoise* when she arose and seemed to go under with difficulty. The current rose fifty or more amperes on every dive, and at the end of the trial seven hundred amperes were necessary on diving.

Further extracts from the official record of that 3-hour submerged endurance run state:—

"Dived to a depth of seven feet and then rose to the surface immediately, diving immediately thereafter. The motion of the boat at this time was very irregular."

"Order given to dive. The vessel dived very irregularly, 'porpoising' between 5 and 15 feet depth by gauge.

"Order given to dive. While diving, maximum angle of trim of vessel was 12 degrees by head."

"Order given to dive. Boat went down to a depth of 20 feet, then came immediately to the surface, 'porpoising' violently."

During this trial the boat was exposed on the surface nineteen times, the periods of exposure ranging from 1 minute and 15 seconds to 8 minutes, and seven of these intervals were more than 2 minutes. From a military point of view, the difficulties encountered and the risks run in thus exposing a vessel to gun-fire are sufficiently instructive to call for no comment. The reserve of buoyancy then carried by the Shark was probably less than 400 pounds, and yet that very modest reserve of buoyancy constituted a serious difficulty in the submerged control of a craft of 122·5 tons, and made it plain that this only feature of static safety must always be reduced to a dangerous minimum in order to secure anything like approximate precision of control. That this is, in fact, the case was later proved by the manner in which the Porpoise suddenly sank to the bottom in the summer of 1904—reaching a depth of 120 feet and being saved from collapse and fatal disaster only by the very narrowest of margins. The Shark started for the bottom under like circumstances, but was fortunately checked before she had reached a depth of more than 50 feet, by the speedy blowing of her ballast and trimming-tanks. Her engines, however, had become flooded with sea-water and she was able to reach harbour only under the impulse of her electric motor. Had that accident happened in the face of an enemy she would either have been promptly sunk or made a prize.

Speaking of the submerged control of the diving submarine, the official report upon the acceptance trial of the U.S. submarine torpedo-boat Adder had this to say:—

"The essential feature of this vessel upon which her success depends as a submarine boat is the means of controlling her depth under water and her handling in the operations of diving and rising to the surface. The mechanical means provided for this purpose are simple and effective, *but it is necessary that the*

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steersman in charge of the diving rudder should have had months of training if he is to handle the vessel to the best advantage."

That even months, yes years, of training is not enough, was shown recently during the trials of a diving boat built for the Dutch Government by an American company. During the trials of that boat in the North Sea in the hands of an expert American crew, the man at the diving rudder gave the vessel the usual helm to get the boat under. When the craft had reached the desired depth, intending to bring the vessel to her proper horizontal course, the diving-rudderman, *by mistake*, gave full diving helm and the vessel plunged so sharply that everything movable started forward and some of the men were thrown off their feet. Realizing his mistake, he then gave a full rising helm and the vessel shot to the surface at an angle of not less than thirty degrees. There were no more trials that day, and there probably would never have been any more with that vessel if she had not then been operating in something like eighty feet of water, which gave a chance to start the boat upward before striking the bottom.

That skilled American crew never recovered its nerve, and it subsequently returned to this country without completing those trials.

Some idea of the exceptional skill required in handling diving boats can be gathered further from official testimony; and it is easy to see why the task of control is hard and hazardous if one analyze the following extract from the report upon the official acceptance trials of the U.S. submarine torpedo-boat Moccasin:—

"The most interesting feature in connection with the performance of the act of diving and of the maintenance of *approximately* steady motion when submerged, was the fact that although the motions of the vessels were, in general, under very satisfactory control, yet in order to maintain uniform conditions, it was necessary to *anticipate* the motions of the vessel, and, for example, *before* she had shown by the reading of her clinometer that she had begun to obey the impulse given her by the diving rudder, the diving rudder had to be brought to a position to check such motion. *This requires very careful training* on the part of the man acting as diver, but with proper training the requirements of *approximately* steady motion appear to have been met in an entirely satisfactory manner for all purposes in so far as motion in *smooth* water is concerned, and while the vessel is not handled in such *shallow* water as to closely approach or touch bottom.

Adverting once more to the question of reserve buoyancy in boats of the diving type and the angle at which they are forced to run submerged in order to produce a balance between the lifting force of the buoyancy in reserve and the thrust of the screw and the tipping force of the diving rudder, let us see how far this departure from the horizontal affects the safety and the military efficiency of the diving submarine. We have seen from the official report of the trial of the Porpoise that that vessel, in diving, attained a maximum angle by the head of 12 degrees. That meant a change of trim at the bow from the normal of 7 feet. With a boat of this type running with 3 feet of her sighting instrument above the surface, she would have between her keel and the water-bed only 6 feet of water when running in

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water only 30 feet deep. With a change of trim by the bow of only 10½ degrees from the horizontal the boat would strike bottom. The Adder and class were only 64 feet long. With a vessel 150 feet long—like the A5 and class—a departure from the normal of 5 degrees would make a difference of trim at the bow of 7 feet, and with a change of trim of 12 degrees there would be a departure from the normal of 16 feet. It is plain to see how very serious this becomes when operating in waters of moderate depths, and the gravity increases with the diving boat by every foot you add to the length of the vessel—the effect at the bow naturally becoming greater as you increase the length of the rocking arm. The angle of dip by the bow necessarily taken by the diving boat when running submerged is a defect of considerable moment as well as a menace in various ways. Speaking upon this point in its relation to the British boats, Captain R. H. Bacon, R.N., in his article on "Causes of Accidents to Submarine Boats, and their Salvage," read before the Institution of Naval Architects in July of 1905, stated: "So far as I know, up to the highest inclinations we ever go—about 10 degrees by the bow."

This shows the angle assumed by the British vessels under normal conditions of diving. Captain Bacon has also stated in the same paper that the vessels run submerged with an angle of 5 degrees by the bow. Apart from the dangers of contact with the bottom and the necessity of greater depths required in which to work the diving boat without hazard of a sudden collision with the water-bed, there is the added difficulty—with its train of risks—of seeing out of the sighting instrument. When running submerged the entire safety of the vessel depends upon the faithfulness and the facility with which observation can be secured of the surrounding waters. Normally the instrument would not be carried at the utmost more than five feet above the surface. In order to get so much of the sighting instrument above water and yet to have the boat deep enough to be beyond the immediate effects of surface disturbance and free from that tendency to plunge suddenly if less than 10 feet under, a sighting instrument about 15 feet long has been found necessary for all diving boats in the United States Navy. (See Fig. 3.) The objective of these instruments is 25 feet above the centre of oscillation, and, as the accompanying illustration shows, a departure of 10 degrees from the *normal* throws the centre of vision either up in the sky or down into the body of near-by waves, if there are any. The great length of these instruments makes it practically impossible to prevent vibration, while their necessarily moderate diameters make it impossible to secure any considerable range of *normal vision*. To widen the field of observation, the observer must be content with a reduction in the size of the image and therefore suffers the handicap of being unable to judge the true distance of his target. Adding to this the strain upon the eye by the vibration of the instrument, the stress upon the observer becomes a serious one after a very brief use of the instrument under service conditions. Apart from reducing the image in order to cover a wider field of view, these long instruments have entailed optical difficulties in the way of transmitting sufficient light to make them reliable except under favourable atmospheric

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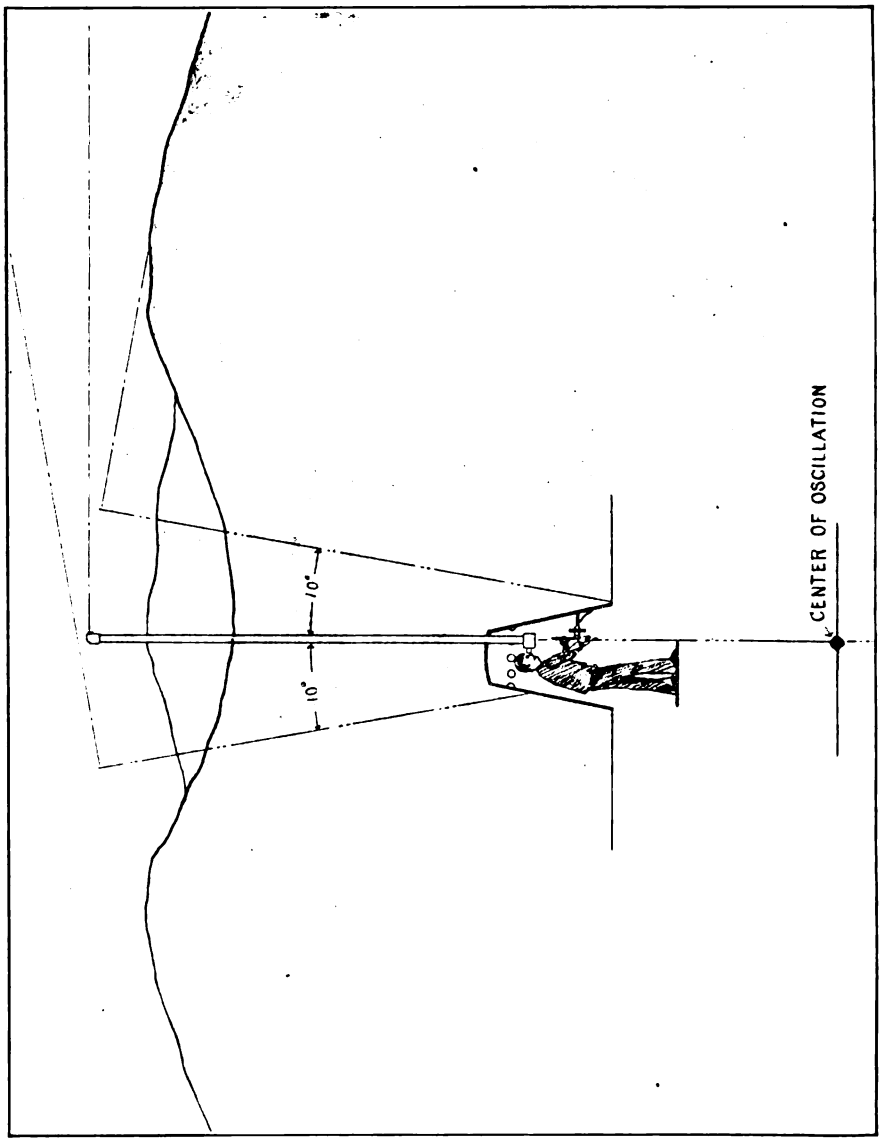
conditions of *daylight: They have been uniformly and notoriously useless at night or in twilight—the very time when the submarine should be able to do her most effective work.* It is necessary that the submarine should be able to observe the entire horizon, and it is especially important that she should be able to cover the waters back of her as well as ahead of her so that she should not be overtaken and run down, as happened to both the A1 and the A9. With vessels of the diving type, requiring for operative reasons that they



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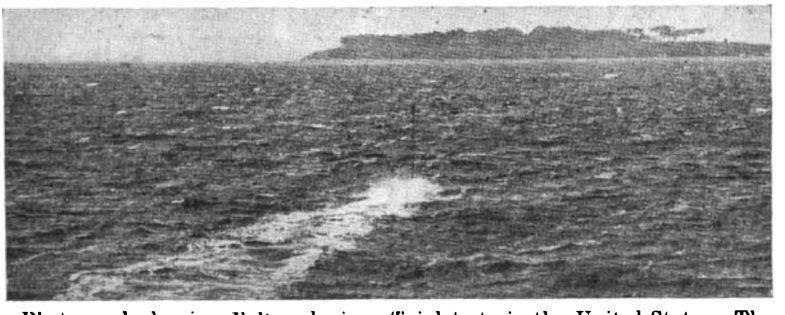
should maintain a continual inclination by the head of from 4 to 5 degrees, it should be evident from the accompanying diagram (Fig. 3) that the trim of the boat which reduces the field of observation forward also reduces correspondingly and even more seriously the scope of observation astern, because *in looking backward the instrument is turned that much more toward the sky where the target or the objective cannot possibly be.*

In the United States, there has never been any difficulty whatever in detecting the approach of submarines when running submerged and with only their periscopes above water for observation. The reason for this is that with the *normal* reserve of buoyancy for submerged work, the boats must have a speed of at least six knots in order to answer promptly their diving rudder and be susceptible of easy control in vertical plane. As a result, the periscope throws up considerable spray and leaves a very pronounced wake which are easily detected at distances beyond torpedo range of such craft. Experiments made by night and by day at Newport, Rhode Island, have proved the ease with which submarines so operating could be discovered. A sea with white caps is not a sufficient cloak for the approach of these boats nor disguise enough for the wake of the periscope. The *steadiness* of the broken water around the periscope attracts the eye even in the midst of natural surface disturbances. The absence of breaks or interuptions in this disturbance is its fatal defect, and this cannot be otherwise unless the speed be reduced and the reserve of buoyancy cut down in order to make this reduction possible.



Photograph showing *Fulton*, during official tests in the United States. The wake and spray from the tube of the periscope are very pronounced, and they were conspicuously visible during the entire submerged run even though the surface of the water was also broken by whitecaps.

In connection with this matter of running at lower speeds, the official report upon the trial of the submarine torpedo-boat Fulton at Newport, Rhode Island, in June, 1904, has this to say:—

"It is manifest and was so shown in these experiments, that this lowest speed (4·5 knots) of submerged navigation, is a direct function of the amount of reserve buoyancy the submarine possesses at the time the trials are held."

Just how small this reserve of buoyancy must have been can be gathered from the official report of the U.S. submarine Plunger,

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fitted with a special adjusting system similar to that of the Fulton, and tested on November 23, 1904, in Peconic Bay. In the case of the Plunger that vessel was trimmed for the ordinary conditions of submerged running and carried the reserve buoyancy deemed necessary for that purpose at the usual full submerged speed. The report reads as follows:—

"The new torpedo loading and compensating gear was tested by loading and firing a torpedo while the boat was running submerged in Peconic Bay. Previous to making this test the boat was prepared for the submerging condition by using a new measuring tank in trimming her for diving. . . . . When there were 55 cubic feet of water (by gauge) in the auxiliary ballast tank the kingston valve of that tank was closed, as the trim of the boat was then approaching closely to a suitable condition for diving; 25 seconds later *the vessel began to sink* (due to a slight negative buoyancy) the gauge on the auxiliary tank then reading 65 cubic feet, at which the supply of water through the measuring tank was cut off. The water in the measuring tank was then blown out by air until the gauge at this tank read 225 pounds, when the vessel started to rise to the surface, coming to rest on the surface with a *positive buoyancy of 200 pounds by the gauge.*"

It is plain, then, that to run these vessels at 4·5 knots recorded during the trials of the Fulton, a reserve of buoyancy of even less tnan 200 pounds must be required. This is a very hazardous reduction when we realize that leakages of a very moderate extent—sea water weighing practically 10 pounds a gallon—would soon reduce this to zero, as happened with the U.S. submarines Porpoise and Shark. The worst of this that the reduction in reserve buoyancy may be so gradual as to escape notice and only become apparent at a critical moment. In August, 1904, the U.S. submarine Shark was engaged in making a daylight attack upon the U.S.S. Peoria outside of Newport Harbor, and her commanding officer had this to say regarding the manner in which that vessel acquired an excess of negative buoyancy:—

"When about 1,000 yards distant from the Peoria the red flag was seen.

"The boat was stopped and was found to have pronounced negative buoyancy, falling rapidly as she lost headway.

"The midship tank was blown and motor started ahead with a rising helm. The boat was brought under control by the time she had reached a depth of 40 feet and brought rapidly to the surface.

"Considerable difficulty was experienced in handling the boat, due to water leaking through the exhaust valves of the engine and through the cylinders into the engine-room bilges, thus continually changing the trim of the boat, and causing the loss of the buoyancy noted."

In regard to the sinking of the Porpoise during the same month, the official report states:—

"On August the 18th, the submarine Porpoise while on a trial lost her buoyancy and settled to a depth of about 125 feet. The cause of the loss of buoyancy, the necessity of preventing a re-occurrence of such a dangerous condition, and the defects of the boat which developed while under the pressure to which she was subjected, have been investigated by the Board.

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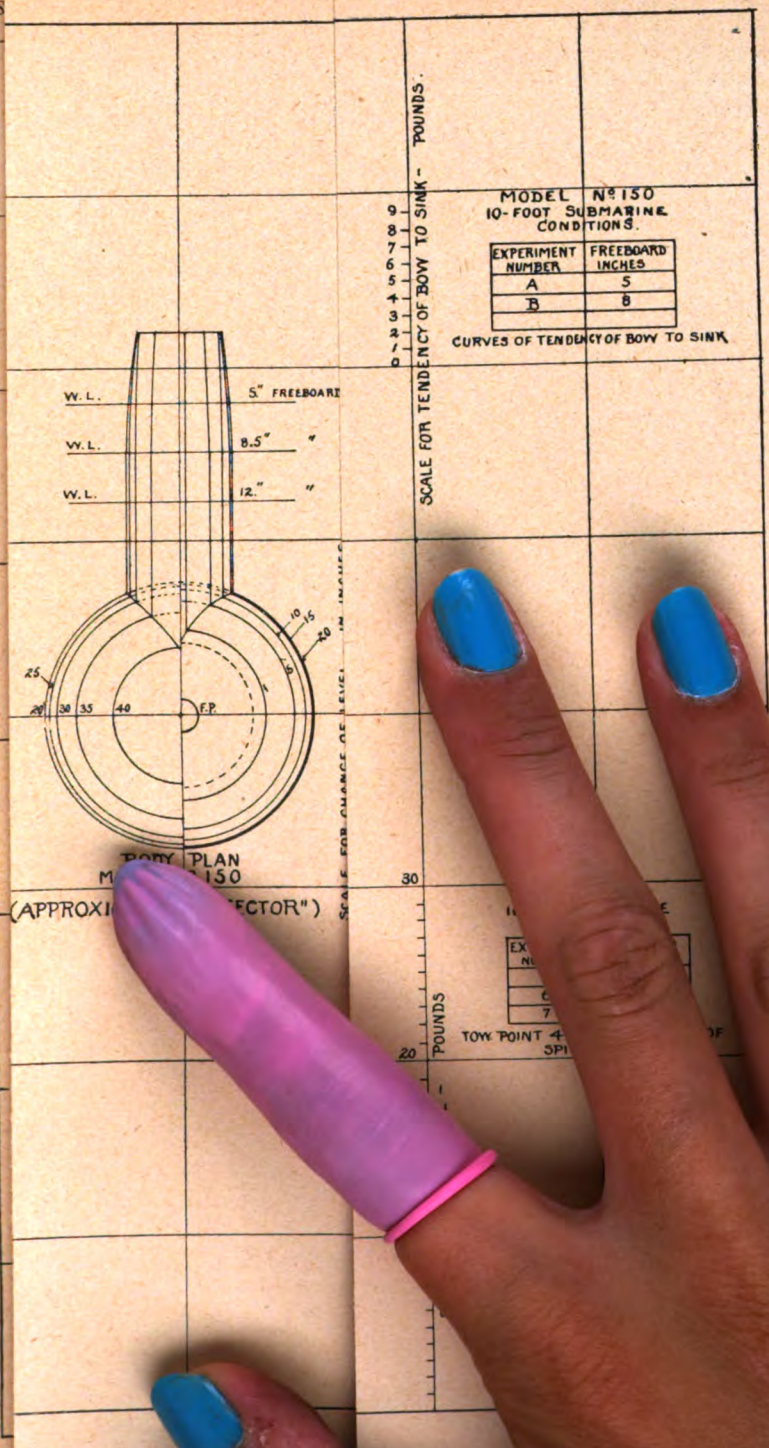

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"The cause of the loss of buoyancy was due to leaky valves, the inefficiency of the rotary pump to pump against heavy pressure, and the weakness of the main water line."

It serves no present purpose to discuss the details of that narrow escape from fatal disaster in the latter case, nor to elaborate upon the desperate twenty minutes of hand pumping under heavy stress that finally overcame the leaks and brought the vessel to the surface. It is enough to know, that had that vessel been operating in waters of greater depth she would have gone to the bottom before being checked and would probably have suffered collapse. It is plain, then, how serious is any reduction in the reserve buoyancy of the boat, and how every pound of diminution trenches that much further in the direction of danger if not disaster.

There is also a strategic aspect to this question. If the normal reserve of buoyancy is retained—and that is all too little in the best and largest of diving submarines (the A class of the British navy having only 800 pounds with a submerged displacement of fully 200 tons)—the boats must be run nearly at full speed submerged in order to make it possible to control the vessels properly. This means that from the moment the boats start to run submerged they must maintain full speed so long as they are travelling below the surface. Naturally the radius of action is limited to the capacity of the batteries to meet that demand continuously—a capacity seldom exceeding three hours at the full rate of discharge. If a wider radius of action be desired submerged, lower speed must be resorted to, and once more a serious reduction must be made in the reserve of buoyancy.

The fact that the diving boat cannot anchor when trimmed for submergence, and the realization that such boats must be continually active if they are to be held at a chosen depth under ordinary circumstances, have led the American builders of diving submarines to instal latterly in their vessels what is termed by them an "adjusting system." As stated in the official report upon the tests of the Plunger in November, 1904:—

"The object of the adjusting system is:—

1. "To facilitate trimming in rough water.
2. "To take aboard or remove a definite amount of water from the ship when the density of water changes, owing to change in salinity.
3. "To balance the boat in a state of rest at any given distance below the surface of the water, the propellor being stopped.
4. "To provide a tank into which all water in the main and auxiliary ballast tanks may be blown up by air pressure in order that either to blow or pump it overboard against the head of water corresponding to any depth at which the submarine may be. This would be required to be done only in case of accident to the bilge pump, but in such a case it furnishes an additional means of safety."

This system has never been tried in a seaway. It has been tested only in smooth and shallow waters. The official report upon these tests reads as follows:—

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"The new adjusting system for so adjusting the amount of water in the vessel's tanks as to balance the vessel at any desired depth, was tested with the following results:

"The Plunger was first balanced with the top of her periscope out of the water, 3 to 4 feet in length of its upper portion being exposed, but all the rest of the boat, including her conning-tower were entirely submerged. The reading of the depth-gauge was kept exactly at 14 feet for *three minutes*, the boat being perfectly balanced for that length of time; subsequently there were slight fluctuations in depth, the maximum variation during the full period of observation of six minutes thirty-six seconds was 3 feet.

"The boat was then balanced totally submerged, the depth by gauge reading 32 feet. The boat remained perfectly balanced at this depth for *two minutes*.

"During both these tests the longitudinal stability of the boat was sufficient to prevent any appreciable change in trim while balancing the boat at different depths; the time the boat was held at the depth noted was considered sufficient to demonstrate that the conditions of balancing were entirely satisfactory *in so far as a test in smooth water could determine*. In service, further tests should be made in a *moderate sea*, to show the value of this adjusting system in balancing the boat near enough to the surface to permit the periscope to be used under such weather conditions."

That the results secured by this system in the Plunger were not considered either satisfactory or convincing is evidenced by the following endorsement by the Chief of the Bureau of Ordnance upon the recommendation to instal these modifications in other vessels of the same class:—

"This Bureau . . . wishes to emphasize the fact that the changes in the loading and handling arrangements, balance tanks, etc., should not be made in the other boats until after they have been *fully* tried out and experimented with on the Plunger. So far the records of this Bureau show that very little attention has been given to firing torpedoes from submarines, and the small amount of practice had has not been very satisfactory. Instructions have been given the Naval Torpedo Station to carry out torpedo practice with the Plunger in order to test the capabilities of the present arrangement of handling and firing torpedoes."

The date of this endorsement is January 6, 1905.

The Plunger, after being subjected to more than a year's remodeling and modifying, had a period of active service in 1905 of less than a week, and at the conclusion of that brief activity was hastened back to the Navy Yard, New York, where she has since been laid up for further overhauling and changes. Apart from this very practical evidence of the uncertainty of these "ameliorations," there are military and strategic objections to this "adjusting system" as installed in the diving boats. Of course its prime object is to permit these vessels to lie passive for observation on piquet duty while exposing only their periscopes, or while lying in suspension but totally submerged. Let us see how far this may be practically applied in time of war. The vessel, we will say, is "told off" for piquet duty in waters subject to strong currents and in channelways too deep to admit of mining. Now the primary idea is, according to the promoters of this method of submerged control, that the

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boat shall keep her station without using up any of her electrical energy—the batteries being held in readiness only for active service when the enemy has been sighted and it becomes time to strike. It has been further stated that not only is power thus conserved until the moment when it may be used with telling effect but that all of the crew may relax and rest save the one operator in control of the adjusting system. In the first place, the vessel's reserve of buoyancy will be reduced to 30 pounds at the outside, if her sighting instrument is only three or four feet above the surface. If the vessel is in a tide-way she will drift and it will be impossible to hold her at the station without recourse to the motors. This means, of course, that there shall be one man always on duty at the switchboard. The moment the vessel starts ahead, there must be a man at the navigational rudder and another man at the diving rudder, and every one must be on the alert and yet very seriously restricted, for it will be remembered that the vessel is in a very unstable condition and any movement fore or aft would destroy her trim. It must be evident that while to some extent electrical energy is husbanded, still it is debatable how far that saving would go if the vessel were supposed to keep even an approximate station in waters subject to strong currents. Besides this, the crew cannot rest in the broader sense of the term, and at least half of them must be continually at their stations and ready for instant service. Suppose a boat so operating were in waters subject to changing salinity, a continual juggling with the water ballast would be required to keep that vessel at the desired degree of submergence, if not needful to prevent her sinking—as happened with the Plunger when her system was first tested officially. This continual admission and expulsion of water ballast calls for a continual expenditure of air from the power flasks, and all the time this air is being spent there is no way to add to the reserve. The gravity of this becomes apparent when it is remembered that the compressed air is needful to expel the torpedoes, compressed air is needed to load the torpedoes into the tube and to control the ballast compensating system for the shifting of those weights, air is needed for breathing purposes, and compressed air is necessary for the expulsion of all water ballast regulating the buoyancy of the craft upon which her safety at a moment's notice may depend. The endorsement of the Chief of the Bureau of Ordnance just quoted gives ample food for reflection, and should make one pause before accepting such a system as this as a feature of any practical worth, under probable conditions of serious service.

It is plain that vessels of this type can be run in war-time trim only under electrical propulsion, and the fatal accident to the A 8 gave distressing emphasis to the tendency of the diving boat to dive suddenly even when running with a measure of buoyancy amounting to a matter of tons. Let us see how far model-experimental tests have confirmed the performances of the full-sized boats in actual service.

During a number of years, the model-experimental tank at the Navy Yard in Washington, D.C., has been devoted at intervals to the examination of various models of submarine vessels in the effort to

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discover a form of hull free from the hazardous impulses to dive, common to this spindle-shaped body. These investigations have been under the direction of Naval Constructor D. W. Taylor, U.S.N., well known to the technical public. The results of these trials have been embodied in an official report, and the importance of so many of the conclusions warrant very liberal quotation. Let us see what Naval Constructor Taylor has to say:—

"I have the honor to report the results of experiments which have been conducted at intervals for several years past for the purpose of investigating certain features of the behaviour of submarine boats.

"These experiments were authorized by Chief Constructor Bowles subsequent to under-water runs we made upon a submarine of the Adder type which was being exhibited in the Potomac river. It was observed during these runs that *when submerged the horizontal rudder appeared to be manœuvred with a view to overcoming a downward pull at the bow.* For the purpose of investigating by means of model experiments this matter of the tendency of the bow to sink, a model of the Adder, No. 111, was attached beneath the carriage of the Basin, being driven by a short length of pipe passing through a hole about the centre of the model. At a distance of 4 feet 1 inch forward of this hole and close to the extreme bow which was connected by thin fins extending vertically upward on each side of the scale-pan of the dynamometer—the dynamometer being balanced with the model at rest,—the net downward pull of the bow could be accurately determined when the model was under way. The model of the Adder was built on a scale of $\frac{1}{8}$th size, being nearly 8 feet long.

"Fig. 1 [pp. 154] shows plotted the curves of downward pull for this model. It is seen that this pull is always appreciable, and is very strong when the top of the model is very close to the surface and even when it is submerged 10 inches. The diameter of this model was $17\frac{3}{4}$ inches.

By an analysis of the curves in Fig. 1, taking the condition of the model $\frac{3}{4}$ of an inch below the surface, and at a speed of 2·1 knots for the model, we get a downward pull at the bow of 1024 pounds at 6 knots for the full-sized vessel. The Adder and class have an over-all length of nearly 64 feet, and it is an easy matter to figure the moment in foot-tons at the bow, tending to force the vessel down when running at that speed. At a speed corresponding in the model to a speed of 8·5 knots in the full-sized boat, there is a downward pull of no less than 3584 pounds. It is very easy to understand, therefore, why the horizontal rudder should be manœuvred, when running submerged, with a continual "rise" in an effort to counterbalance this tendency to plunge or dip by the bow. Realizing that vessels of this particular type are necessarily lacking in longitudinal stability, it is perfectly plain how serious must be the task of the man in control of the diving rudder; especially when the boat is running fairly near the surface and under a disturbed condition of the sea, with a continually changing head of water over the craft and probably influenced by the subsurface effects of wave motion. In boats of this particular diving type the man in charge of the diving rudder is removed from the observation of the commanding officer —the latter being isolated in the conning-tower—and is absolutely limited in the knowledge of the conditions about him to the indica-

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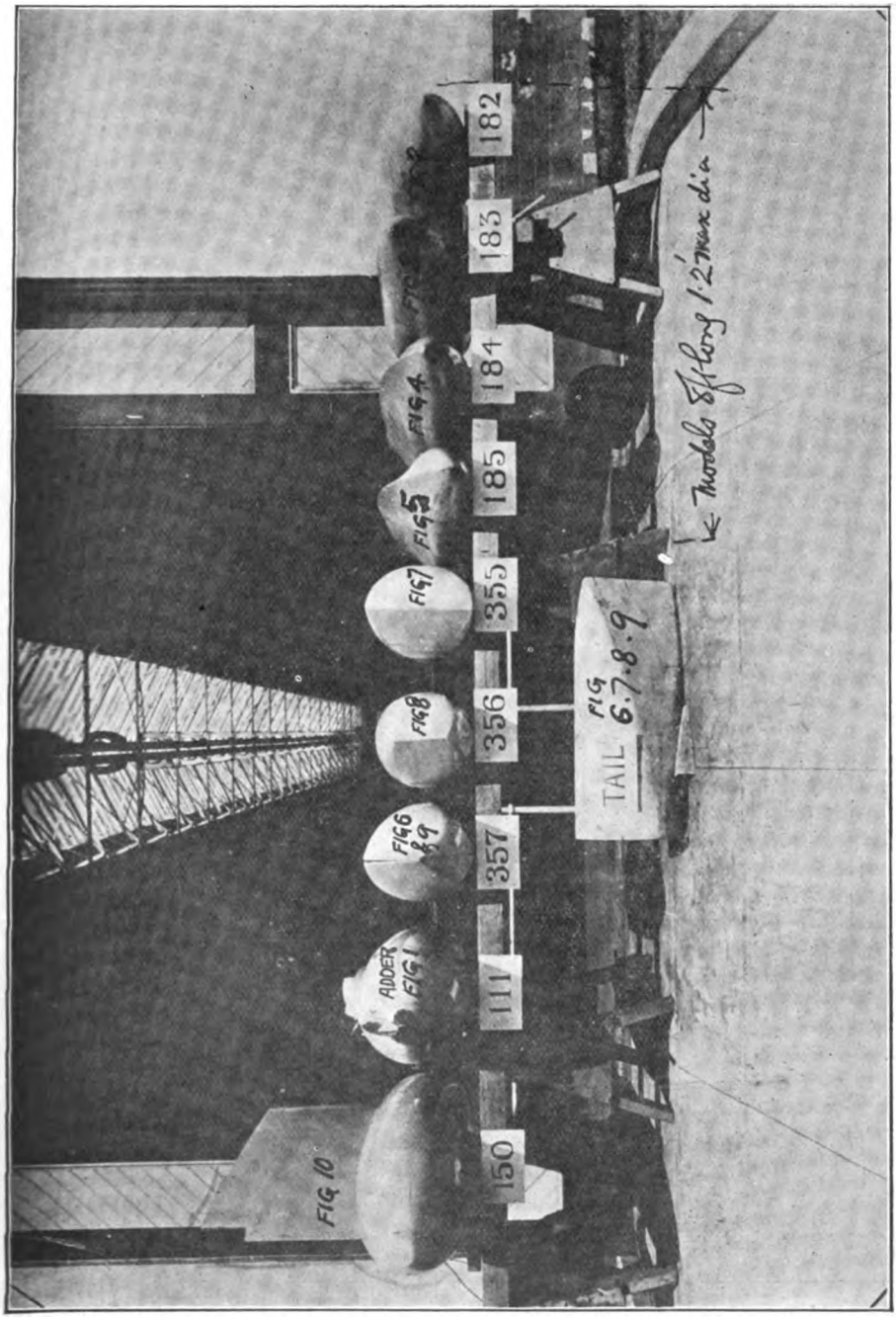

Fig. 5.

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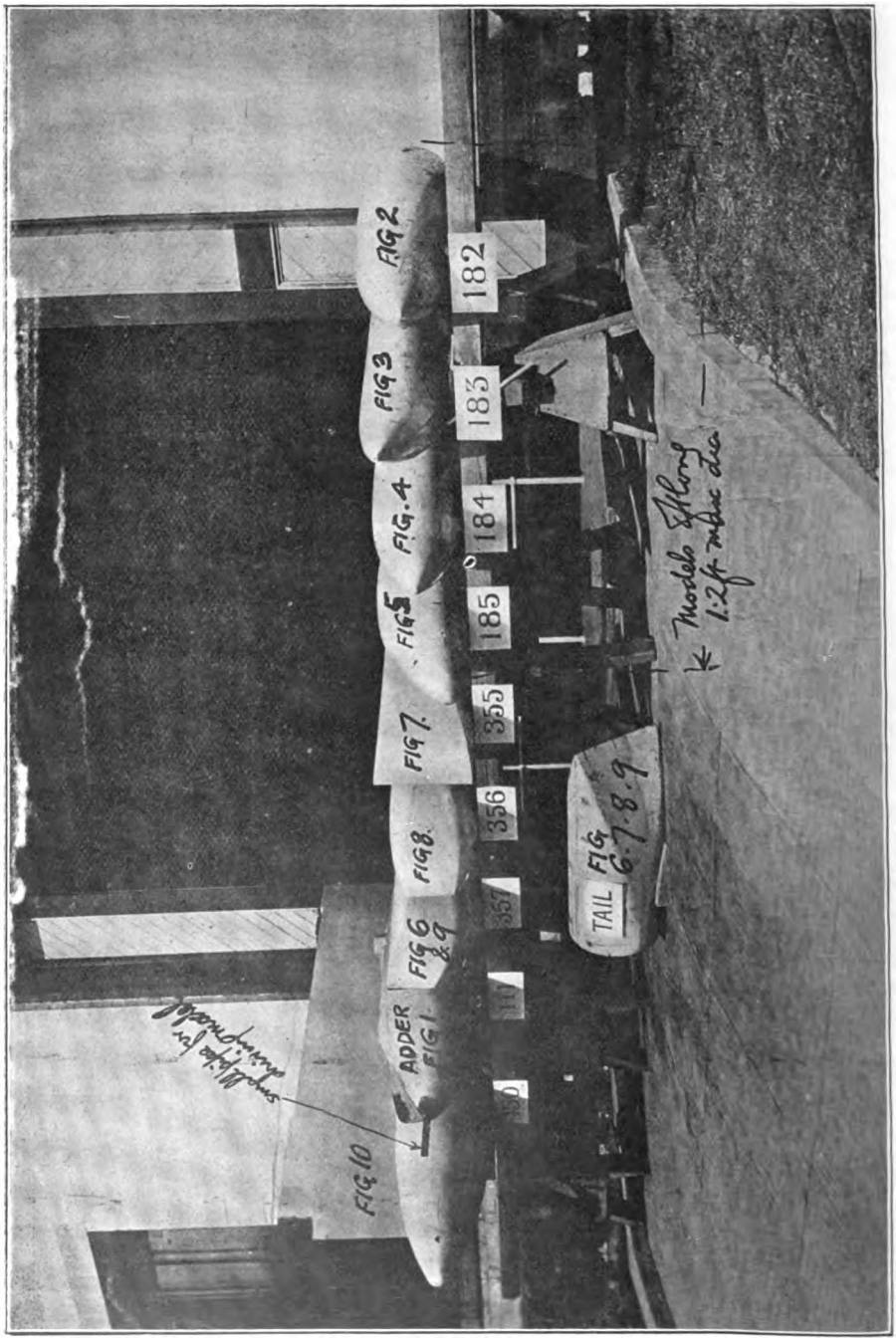
FIG 2
FIG 3
FIG. 4
FIG 5
FIG 7.
FIG 8.
FIG 6 & 9
ADDER FIG 1
FIG 10
182
183
184
185
355
356
TAIL FIG 6.7.8.9
Models of Hong 1:2 ft span dia

Fig. 6.

tions of the dial of the depth gauge before him. That this involves a serious menance to the well-being of everybody aboard has been testified to by Lieutenant H. H. Caldwell of the United States Navy, who has said, after many months of familiarity with the boats in the American navy:—

"The officer in the turret cannot see what his men are doing and must be able to rely thoroughly on them, as the *safety of the boat depends on the individual action of* ANYONE."

The force of this was brought out in the details developed during the official inquiry into the loss of the A 8.

Let us continue with Naval Constructor Taylor's report:—

"As the future development of the submerged boat is evidently largely dependent upon an increase in speed, and, as the behavior of the Adder model *showed clearly that to drive a vessel of this type at high speed when below, but near, the surface would probably be entirely impracticable owing to the difficulty of controlling it in a vertical plane,* it appeared advisable to investigate the practicability of forms which would be stable in a longitudinal plane under water, that is to say, would shew little or no downward pull when slightly submerged."

"The first series of models made and tested in this connection were numbers 182 to 185, inclusive, four in number. Model 182, as will be seen from Fig. 2, [see Fig. 5 and 6] consisted of a spindle of revolution for the fore-body and a kind of wedge shape for the after-body. All these models were 8 feet long and 1·2 feet maximum diameter. Nos. 183, 184 and 185 had each a cylindrical after-body cut off square. This after-body was originally 4 feet long, the fore-body being 4 feet long also. Experiments made by cutting off portions of the cylindrical after-body indicated that the downward pull was but little affected by this process, the differences between the downward pulls of a fore-body with varying lengths of cylindrical after-body being mainly due to secondary effects of the bow-wave as it appeared aft, and accordingly I have not complicated this report by giving the results with varying lengths of after-body.

Fig. 3 pp. 154 giving the curves of model No. 183 is interesting because it gives in general form the fore-body of the Octopus and class now building in the United States for the American navy. It will be seen that this form of fore-body—still retaining the spindle shape—does not constitute a solution of the difficulty nor remove the tendency to dive unexpectedly.

Resuming Naval Constructor Taylor's report:—

"In Figs. 2 to 5 are found results with models 182 to 185, inclusive. It will be noted that with the exception of 182, all of these models were tested as shown in the figures, and also bottom-side up. The resulting curves shown that in every case when the model is near the surface, whether right-side up or bottom-side up, there is a strong downward pull of the bow.

"The second series of models, Nos. 355, 356 and 357, were then made and have been recently tested. It is seen that these differ essentially from the former series in that the bow is more or less wedge shaped in a vertical sense. These models were all 8 feet long with a maximum diameter of 1·2 feet, being circular at their midship section. A single tail, also wedge-shaped, was used and this was

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so fitted that it could be attached to each model with the after-edge vertical or horizontal. Model No. 357 was fitted to be turned upside down. Nos. 355 and 356 were symmetrical. . . . . The perturbations due to the variation in the position of the tail are quite perceptible. . . . . These breaks are due to the position and strength of the bow-wave under the tail. It is clear, however, that whether the tail is flat or vertical, the general phenomena are much the same and that for this series of models, too, there is no indication of a form which would be stable in the vertical plane when moving at a speed within its own diameter of the surface of the water. As the submergence is increased there is less instability, but at the deepest submergence, 21 inches to the top of the model, which is 1½ times the diameter of the model, there is still a serious downward pull. It appears then that, while it is impossible to say that a form with vertical stability under way cannot be had for a submarine boat, none of the forms tried appeared to give much encouragement in this direction. The wedge-forms of the second series appear, generally speaking, to be more favourable than the round forms of the first series, but it should be borne in mind, of course, that for strength it appears necessary to make the main body of the submarine round, and that the wedge-shaped form could be obtained only by superposing upon the round body a superstructure open freely to the sea.

"Concluding then, that a submarine form with longitudinal stability cannot be developed to enable a submarine boat safely to maintain a high speed when below, but near, the surface without mechanical appliances for vertical control, which, *if possible at all*, must be infinitely superior to anything yet fitted upon present low-speed submarines, the question next arises as to the most favourable arrangements for maintenance of speed on the surface. While the forms hitherto referred to were tested wholly submerged, the primary object being, as already stated, the development of speed submerged, *it evidently would not be safe to run such models at high speed with only the conning-tower emerged.* Safety would require that high speed be used only with a sufficient bulk of the model above water to give longitudinal stability sufficient to resist any downward pull from the bow.

"In this connection, experiments were made with model No. 150, the model itself and the results of experiments being shown on Fig. 10 (pp. 154). Model 150 was 10 feet long and the main body had a diameter of 1·5 feet. It is seen that the main body is of pure spindle type and that superposed upon it is a vertical superstructure coming to a knife-edge both forward and aft and extending the greater part of the length of the boat. The photographs herewith [Fig. 5 and 6] show this model more plainly. The idea of the vertical superstructure would be to use it simply as a fair-water, and, when ready to dive admit water freely to all portions of it except to a cylindrical tube connecting the main body of the submarine with the conning-tower. Owing to the difficulties of towing such an awkward model, the curves referring to it do not extend to as high a speed as desirable, but *it was evident that with a reasonable freeboard of superstructure a vessel upon this model could be driven on the surface at a high speed without danger of taking a slant and suddenly submerging.*"

Model No. 150 was what might properly be termed "an approximate Protector." (Fig. 9) It will be seen from the accompanying photograph of the Protector that the superstructure of that vessel rises vertically from the point of maximum horizontal diameter of the main, spindle-shaped hull, and, as a result, naturally forms a *complete* fairwater, as Naval Constructor Taylor describes it, for the entire

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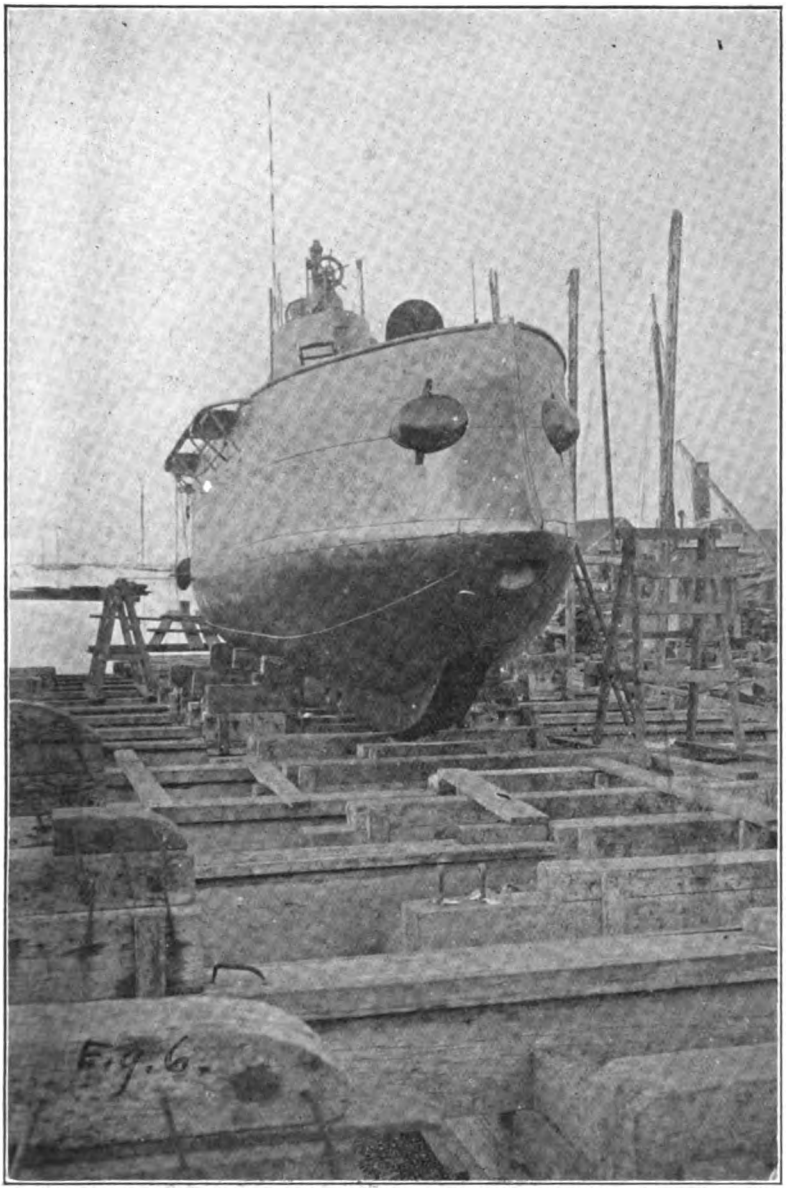

Fig. 9. "Protector" on drydock.

upper half of the cigar-shaped hull—thereby *entirely* removing all of the disturbing influences incident to that troublesome form of main body necessary to boats of the diving type.

Speaking further of model No. 150, Naval Constructor Taylor says:—

" Model No. 150 was also arranged so that it could be towed from a point

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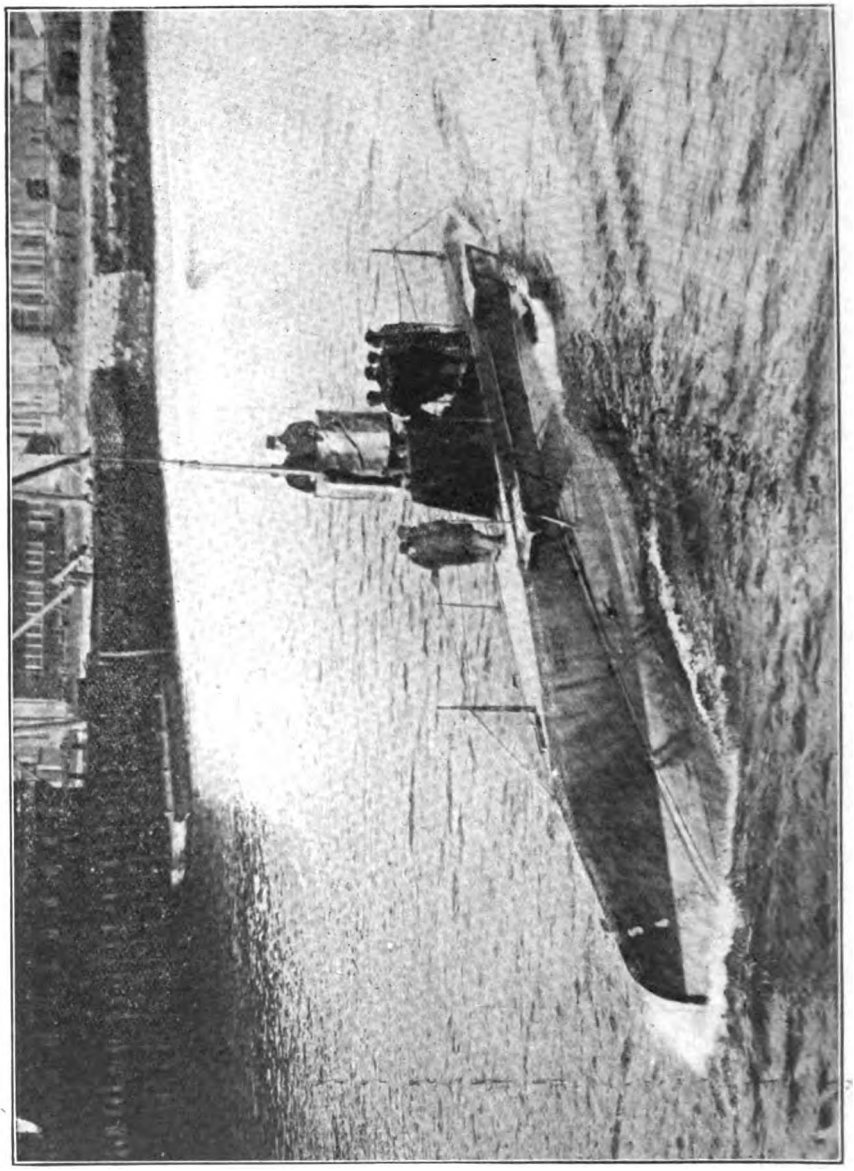

The U. S. "Octopus" in light surface condition. The two rectangular platforms (white) shown outside the deck line are two of the four hydroplanes now carried by these diving boats in an effort to make them submerge more nearly on an even keel, and thus lessen their tendency to plunge by the head.
Photo by Boston Photo News Co.

at any level from 4 inches below its centre to 12 inches above its centre. The effect of the height of towing point upon the change of trim of the model was so small as to be hardly perceptible, indicating that the verticle position of the propeller shaft on such a model would have little or no effect upon the tendency to change trim, the influence of the stream-line pressures being much greater. The propeller as usually fitted has some directive force tending to constrain the vessel to advance parallel to the propeller shaft, but this, too, must be slight in comparison with forces of perturbation at the bow."

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In the Octopus and class, now building in America for the United States Navy, it is said the propeller shafts are placed at an angle to the major axis of the boat, in the hope that they may produce a sufficient upward thrust at the bow to offset the natural tendency to plunge common to the shape of hull in those diving boats. As Naval Constructor Taylor's experiments show, the helpful results to be obtained in this manner are practically negligible in comparison with the disturbing forces developed at the bow, and therefore this position of the driving shafts will probably lead only to more difficulties in controlling the boats when submerged. This is especially true when it is recognised that the enlarged conning-towers now being put on boats of the diving type have already added to the difficulty of their control when running with the full reserve of buoyancy that they should carry when trimmed for submerged work. The distance between the centre of gravity and the centre of buoyancy of these diving boats is necessarily very limited in order to provide the longitudinal instability essential to their control. As a result, the resistance offered by the large conning-tower placed so far above the centre of buoyancy gives a rocking arm that becomes considerable when the vessel is running submerged at full speed. If to this tendency to bring the boat up by the bow is added a contributing force by reason of the line in which the shafting is placed at an angle above the longitudinal axis of the craft, the difficulties of making the boat dive properly become considerably increased. That these larger conning-towers are a necessity was proved as soon as the first of these modern diving boats was subjected to sea-going tests in even moderately rough waters. From the first, the A class of the British navy was so modified, and in the "Engineer" for March 25, 1904, is this regarding the value of the large conning-tower in the case of the A1—lost but a short while before:—

"She made the voyage to Portsmouth from Barrow in bad weather, during which her accumulators short circuited in consequence of the violent tossing about that she received. But for her lofty conning-tower she would never have survived the gale. For some hours she lay as a log on the water, and the crew only lived by taking turns at getting air in the conning-tower."

In the American navy the boats that have been modified have received conning-towers considerable larger and higher than those at first installed on the Adder and class, but even this change has not proved a material betterment. The Fulton had the type form of this higher and modified conning-tower. During the sea-trial of that vessel the official report read as follows:—

"There was a smooth sea, with a long moderate south-easterly swell and a light breeze from east to south.

"It was noted that with the sea then running, it was impossible to observe satisfactorily through the conning-tower ports."

Some popular accounts of the performances of the submarines now in the United States navy have given a highly coloured version to the achievements of those craft, and among these is the oft-quoted

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run of the submarine Shark from the Naval Torpedo Station, Newport, Rhode Island, to Martha's Vineyard, a distance of 30·5 knots. This is the testimony submitted to the Committee on Naval Affairs before the United States House of Representatives by Rear-Admiral Converse, Chief of the Bureau of Navigation:—

"The circumstances attending the attack of the Shark on the ships off Martha's Vineyard on September 15th were as follows:

"The Shark was at the dock of the Naval Torpedo Station, Newport, Rhode Island. The U. S. S. Columbia and the U. S. S. Prairie were at anchor off the south coast of Martha's Vineyard Island on the night of September 15th, 1904, about three miles to the eastward of the battleship squadron then at anchor off the coast of the same island.

"The Shark proceeded to Menemsha Bight, with the intention of attacking the Columbia and Prairie, and was *accompanied by another vessel to assist her in case of emergency.* The boat proceeded *on the surface* to Menemsha Bight, *the sea being smooth.* Failing to find the vessels at Menemsha Bight she proceeded to the south of Martha's Vineyard, steering for the Columbia and Minneapolis under cover of the battleship squadron, *by certain vessels of which she was discovered.*

"Steering from under cover of the battleship squadron the boat then dived and ran submerged for the Columbia, at a depth of 15 to 17 feet under the water. This was at 3.20 in the afternoon, the boat having left her slip at the Torpedo Station at 9 a.m. When the vessel had arrived within about 50 yards of the stern of the Columbia she was brought to the surface and the Columbia then sighted her, not having seen her previous to that time.

"*It should be stated that this, of course, did not simulate a war condition, inasmuch as the alarm would have spread upon the sighting of the boat from the battleship squadron, and again the vessels would have been under way, with all picket launches out and light craft scouting off the enemy's port, from which such a vessel could have emerged.*

"The Shark started back to the Station at *5.45 p.m., arriving at 11 p.m.* During this run there was a *moderate sea,* which the boat took easily and behaved very well. A few heavy rolls were made, as high as 25°, in the choppy sea. It should be noted with reference to this return trip that the *steering had to be done from deck, the low conning-tower making it impossible to steer in such a sea from inside of the boat.* Waves swept the deck three or four feet deep at times, *rendering navigation exhausting and arduous.*

"As an endurance test this run was successful. The difficulty of seeing in *any sort of a seaway* from inside the conning-towers of all similar vessels necessarily limits their operations mainly to purposes of harbour defence, and the mouths of estuaries or harbours, as against close blockade, etc.

"For services at sea the conditions must be favourable for such a boat and the position of the enemy fairly well known in order that an attack may have a reasonable chance of success—that is, to attack an enemy's ship off shore the submarine should know approximately where to look for her, and for a *reasonable* chance of successful attack *the enemy must be at anchor or lying still in one position. Once it is known that the submarine is in that vicinity the attack of such a vessel would be entirely foiled by the ship or ships moving away.*

From the foregoing official report it will be seen that it took the Shark six hours and twenty minutes to cover 30·5 miles under her

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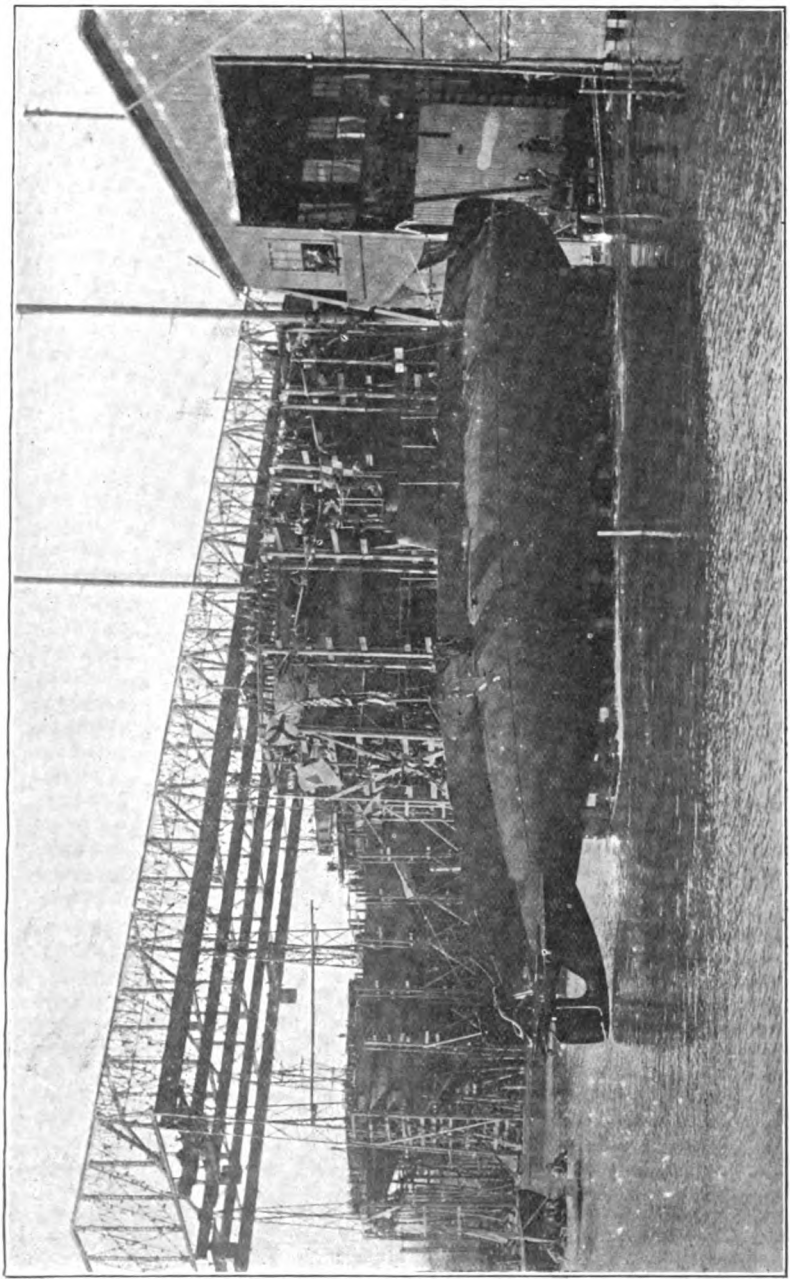

Photo by Boston Photo News Co.

Launching of U. S. Submarine "Cuttlefish."

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gasolene engine on the trip out, and five hours and a quarter were needed for the run home before a following sea. With an endurance of not more than four hours at the outside under electrical propulsion, it does not require much figuring to determine how useful such a craft when running submerged would be in the presence of an alert foe. The great range of modern ordnance and the character of the scouting craft of an up-to-date fleet make the necessity of a " close blockade " of any port quite unnecessary; and this change in the matériel of the battle fleet has rendered useless submarines of the character of the Shark and class.

A practical test was made by the Russian Government in the fall of last year to determine the sea-keeping qualities of boats of the diving type and classmates of the U.S. submarine Plunger. Two of these vessels were ordered to make the trip—under convoy of course —from Kronstadt to Libau. It was soon found necessary to make frequent halts and to seek shelter whenever the seas became at all heavy. It is reported that one of these vessels was driven ashore—probably because the weather was too heavy to have any of the openings free to supply air for the gasolene engine and because something went wrong with the electric motors, the only source of propulsion under the circumstances. The other boat proved equally unable to stand up in the heavy weather under gasolene propulsion, although the immediate results were not so serious. At one time during this interrupted trip, the latter boat was caught in a blow while under her engine. It was necessary to close all openings immediately after shutting down gasolene propulsion, and the distance from the nearest port was such that she was just able to make harbour before her batteries became exhausted. It was impossible to get out on deck to clear away the anchor and cable, and so to bring the boat around into the wind and heave her to until the worst of the blow had passed. This inability of the diving boats to hold their own in a seaway under their maximum source of propulsion is one of the crucial weaknesses of the type; and these Russian experiences serve only to add emphasis to the conclusions drawn by Rear Admiral Converse upon the performance of the Shark.

Adverting again to Naval Constructor Taylor's model-tank experiments, let us see what he has to say in conclusion and the deductions he draws after his model experiments, having then full knowledge of the performances of the submarines in the United States Navy. He concludes as follows:—

" Bearing in mind the *fact* that with accumulator driven electric motors it will be difficult to instal sufficient power for high speed below the surface, it seems to me that at present the natural line of improvement for submarines would be as follows:—

1. " Adopt a general form which will allow high speed to be *safely* maintained when nearly in the awash condition or when ready for diving promptly.

2. " Largely increase the gas-engine power, increasing, too, the size of the boat in order to reach the maximum speed possible when in the above condition. *Put up for the present with low speed under water.*

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3. "If a form having naturally longitudinal stability under way near the surface is not discovered, attempt the development of appliances to control mechanically the downward pull of the bow. Large horizontal bow rudders, or the equivalent would accomplish this if satisfactory control apparatus could be fitted."

Actual practice and Naval Constructor Taylor's experiments have proved that it is at present impossible to drive at high speeds a boat of the diving type safely when in a part-submerged condition. To get high speed submerged, or nearly submerged, means an extravagant or prohibitive outlay in the shape of excessive weights in the electrical installation; and experience wherever a considerable speed has been secured submerged has shown that that speed is necessarily purchased at the expense of radius of action and endurance. Naval Constructor Taylor very reasonably, then, recommends that for the diving boat low speed under water be accepted at present while every effort be made to increase the surface speed by augmenting the gas-engine power. Bearing in mind the fatal tendency to dive inherent in boats of the diving type, one reasonably asks what material advance is made in increasing the surface speeds unless it be possible to run the boats under gasolene propulsion in some of the stages of part submergence. How far the latter can be accomplished is still a matter for speculation. In the case of the A 8, that vessel was running at a speed of 10 knots; she was trimmed four degrees by the stern; her conning-tower hatch was then more than 7 feet above the water-line; and she had a reserve buoyancy of 6 tons, yet despite all of these conditions, presumably favourable, she plunged suddenly through no serious shifting of weights or the admission of water prior to the moment when her conning-tower hatch passed beneath the surface. Both Sir William White and Captain Edgar Lees have gone on record to the effect that limited longitudinal stability in connection with a tendency to plunge by the bow at certain speeds and trims, due to the spindle form of hull, were directly responsible for the loss of the ill-fated craft. Such, however, seem to be the irremovable faults of the diving type of boat.

In the United States Navy, these limitations have been acknowledged by an official order restricting the practice waters for the submarines in that service. The Navy Department has prohibited the boats operating in waters of depths greater than 8 fathoms, and as rapidly as possible heavy sea-going tugs with special salvage appliances are being provided to accompany the submarines at all times when operating in depths exceeding this limitation. This official admission of risks run is not well calculated to inspire confidence among their crews, and it fosters at once a spirit of disquietude should service take the boats beyond depths admitting of speedy salvage. That actual fear has already been bred among the crews of submarines in the United States service is evidenced by the following extracts from that staid paper, the "New York Sun," of May 11, 1905:—

"San Francisco, May 10.—The submarine boat Grampus was scheduled to be tested in the bay yesterday, but the test was not made because the crew mutinied and refused to go down in the boat unless another officer was substituted for Ensign Stanley Woods.

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" An informal Court of Enquiry was called, at which Ensign Woods defended himself, but the steersman and others of the crew declared positively that on a former occasion Woods had lost control of the boat in comparatively shoal water and that they would not risk their lives under his command."

This becomes more significant when it is known that Ensign Woods had been eighteen months in the service when the mutiny occurred; and the incident becomes still further instructive when it is learned that the Navy Department deemed it wisest to take no open action in the matter—tacitly admitting thereby the recognized difficulties of control and the dangers peculiar to those boats in the United States service.

Returning to British experience, it is known, of course, that like the United States, official recognition so far has been confined to boats of the diving type. In his discussion of Captain R. H. Bacon's paper upon " Causes of Accidents to Submarine Boats and Their Salvage," Sir William White said:—

" With regard to the use of horizontal rudders and the various precautions that must be taken to *keep men stationary* in order to avoid a change of longitudinal trim, all these are instructions which ought to be rigidly observed, but which experience leads us to believe will occasionally not be fulfilled; and so, if anything can be done to increase the margin of safety and to give greater freedom from the possible occurrence of human error, it is desirable to do it."

In answer to this. Captain Bacon said:—

" If you want to train a person to handle this boat in war time you must tell him to be careful, and point out to him what he is to do and not to do, but you cannot go on cramming carefulness down his throat every day. As to the boat diving owing to the crew altering their positions in the boat, there is no danger in *moderate movement*, but *the time of duration of a dive in these boats is at the outside three hours, and there is no more difficulty in sitting still for three hours in a submarine boat than there is in sitting still for three hours in a train* "!

Captain Bacon impliedly admits that it *is* necessary for the crews in the British boats to remain substantially immobile during the period of submerged running, which by reason of the limit of endurance of the storage of batteries, is a period of not more than three hours. Now it will be recognized, of course, that this immobility follows as a matter of course even during peace-time manœuvres. Captain Bacon says this is all part of the training of the person to handle the boat in *war time*. Fancy likening sitting in a train—where one seldom if ever questions for a moment one's safety—with the possible conditions of service and the meeting of an emergency in time of war and active duty on a submarine! Anyone at all familiar with any type of submarine knows that there are moments that call for the promptest and quickest sort of action; and the stress of warfare is likely to multiply the suddenness and the variety of these demands. It will not be possible then for the crew to remain immobile during the entire period of submergence, and one ponders over what might happen under that stress if members of the crew should move quickly and in unison in any single direction in the discharge of those duties that the occasion may exact. In a submarine one is living in an

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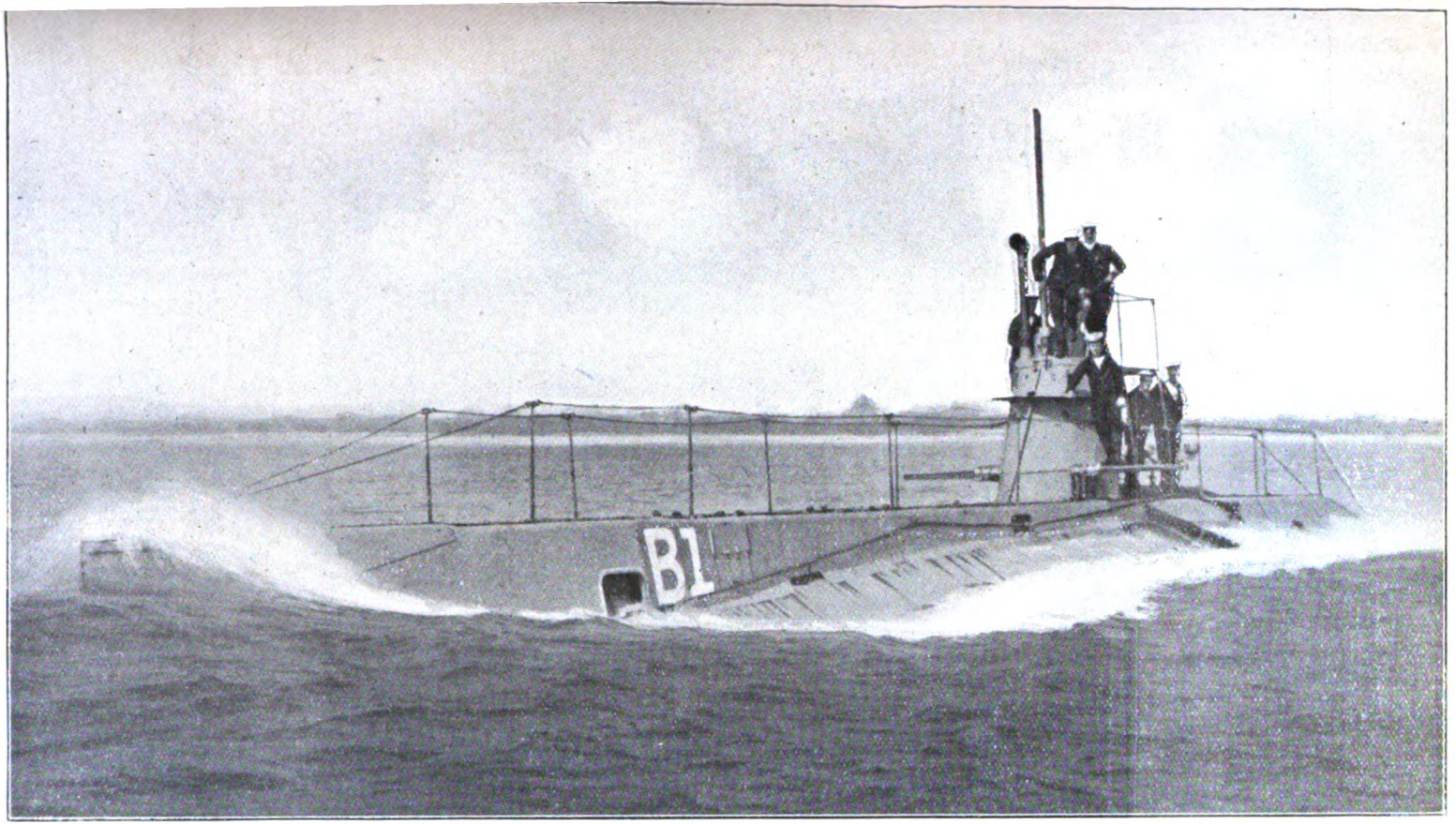

BRITISH SUBMARINE "B 1"; 300 Tons (Submerged); Speed 12 Knots Surface, 8 Under Water.

The vanes spreading athwartship from near the base of the conning-tower are really hydroplanes which the British authorities are adopting in their effort to make EVEN-KEEL boats out of their diving submarines. This is the first outward evidence of the change of working principle reluctantly accepted only after fatal mishap. — *Copyright, West & Son, Southsea.*

[To face page 170.

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atmosphere of physical and mechanical tenseness. The nerves are keyed up to a concert pitch; the depth gauges tell of growing water pressures without; the air pipes are loaded with a menancing charge should leaks occur; and there are weapons loaded with one of the most destructive explosives. Should anything show the slightest evidence of failing, only instant action would be of avail, and one cannot cease to marvel upon what Captain Bacon based his simile.

In regard to the question of men moving about within a diving boat when running submerged, let us advert once more to the official trials of the U.S. submarine Shark in 1903. Remembering the erratic behaviour of that boat when running submerged, as already quoted, it may be of further interest to learn the effect of moving members of the crew about during a submerged run. The report reads as follows:—

"Reached a depth of 9 feet. At this time the motion of the boat had become fairly uniform. An endeavour was made to determine the effect upon the angle of the diving rudder of moving the men about within the boat. A man weighing 140 pounds was moved from a point just forward of the gasolene engine to the extreme forward end of the vessel (a distance of about 25 feet), the resulting change in the angle of the diving rudder being less than two degrees. The change in the position of the diving rudder due to the normal conditions of balancing the excess buoyancy by the tendency to dive due to the diving rudder, was five to six degrees, the rudder being moved from approximately an angle of about two degrees to rise to four degrees dive. The movement of the men within the boat was, therefore, negligible, and, as a matter of fact, men were moved about the boat at will, the only *necessary precaution* being to inform the man at the diving rudder that change in position was to be made, and to *move with moderate speed from point to point.*"

No better evidence is needed of the practical limitations to free movement than the foregoing facts. Just fancy the task set the man at the diving rudder under normal conditions when operating at the usual depth below the surface, where still subjected to all the uncertain influences conclusively demonstrated to be present by model experiments and by the actual performances of full-sized boats. Add to this man's task, under the nervous stress of war, the burden of checking his boat against the consequences of sudden movements on the part of the crew, which could then no longer be made at the moderate speed prescribed in the fore-going peace manœuvres. Surely very grave risks will be run in getting a boat of that type anywhere within striking distance of an active enemy, and one cannot help but recall what Sir William White has said in his able articles, upon submarines, in the London "Times, of 1905:—

"It is not possible to secure the power of *diving* rapidly without accepting the risk of going to the bottom before the enemy is reached."

Where the submarine is working in waters of considerable depths, there would be, of course, perhaps ample latitude to allow for considerable variation of movement in the vertical plane without inviting troublesome consequences or mishaps; but where the boats are working in waters not more than 30 or 35 feet deep, any sudden change

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in trim might cause the boat to strike the bottom with disastrous consequences or make her broach and expose her body to the gun-fire of a watchful foe. In addition to this, a torpedo discharged at such instants might either bury itself in the bottom—if striking a hard substance possibly exploding dangerously near the submarine—or broach clear of the surface and be effectually diverted from its proper course by the blow of a passing wave.

Professor J. H. Biles, at the July meeting of the Institution of Naval Architects, in 1905, speaking of the experience had with submarine boats of the diving type and of those of that type in the British Navy particularly, said:—

"The matters connected with submarines have been prudently kept secret by the Admiralty while they were in process of development, but a great many of them have not remained secret, and I suppose there are a great many people who are willing and able to devote their energies and brains to the consideration of some of these difficult problems in connection with submarines which have apparently not been completely solved. One of these questions is the longitudinal stability of the boat near the surface of the water, where the water-line area is so constantly changing form even in still water, and where it is changing so much more rapidly and in such a varying way according to the varying conditions of speed and sea through which the vessel is going. The problem is quite a complicated one; it is one that probably can only be solved completely by experience at sea; but, as the solving of it *involves the risk of sinking the vessel*, it is certainly much more desirable to carry out investigations at first on a small scale rather than on the full size."

The loss of A 8 was one full-sized solution that cost the British Navy a distressing loss of life, and the model experimental tests made in America by Naval Constructor Taylor presaged that disaster in a most conclusive manner.

Such are the limitations of the diving type proved beyond question. The United States, like Great Britain, has heretofore confined official encouragement to the diving submarine alone, but there are officers in the American Navy familiar with both the diving boat and the submerging or even-keel boat, and in the December number of the "Proceedings of the United States Naval Institute" for 1905, Lieutenant J. H. Tomb contributed a serious article upon the matter of types, and without going into details now of all the points raised by that article, Lieutenant Tomb's conclusions are significant under the circumstances. He says:—

"The main features of the even-keel type are superior to those of the diving type; and, seeing this, it is necessary for our navy to develop that type if it wishes to have an *efficient and capable navy in the future.*"

A further confession of the weaknesses of the diving type is made in the contracts for the four diving boats now building for the United States Navy. These boats are the latest and most advanced types designed by their builders in America, and are reasonably assumed to be material improvements upon their smaller pioneers of the Adder class, yet, despite the facts, the contracts for these new vessels have omitted the clause in the contracts for the Adder and

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class calling for an "*awash*" *trial under gasolene propulsion.* In other words, the risks run under those circumstances are now officially admitted—both by the Navy Department and the contractors,—to be too great to warrant such a trial being a contract condition of acceptance. This is certainly retrogression rather than progress in the art.

In conclusion, the weak points developed so far in the diving submarine are principally as follows:—

1. Seriously reduced longitudinal stability under all conditions, which becomes dangerously diminished in the various stages of part or total submergence.
2. A form of hull—essential to the diving boat—which allied with longitudinal instability, makes the boats prone to plunge when the full reserve of buoyancy is reduced and the vessels are running at considerable speeds.
3. A form of hull that makes the boats sluggish in a seaway, and which requires that the diving boat be sealed up in even a moderate sea and have recourse to electrical propulsion with its reduced endurance.
4. A form of partial superstructure—designed to make the diving boat more seaworthy and less prone to sudden plunging—which becomes a dead weight when submerged and thereby raises the centre of gravity of the craft and makes her more unstable in the diving condition.
5. A diving boat to dive must change the direction of her longitudinal axis, and as the boat increases in length this departure from the horizontal, measured vertically in feet, grows proportionally even though the change of trim in degrees is the same as that of a smaller and shorter boat. This means that the depth of water in which a diving boat can be manœuvred with comparative safety is a factor *not of the draught but of the length* of the diving submarine.
6. A fore-and-aft tenderness when trimmed to submerge that substantially imposes immobility upon the crew and which also makes peculiarly grave the admission of even a very moderate leakage, as evidenced by the sinking of the British A 4.
7. A limited reserve of buoyancy even when in the light condition, and a dangerously reduced reserve of buoyancy when trimmed for submerged work.
8. Extraordinary skill required to keep a diving boat under control submerged at even *approximately* uniform depth; and any momentary inattention or mistake on the part of the man at the diving rudder may produce dangerous if not disastrous changes of trim and depth of submergence—especially when running at full speed.
9. Diving rudderman requires months of careful training, and relatively few are fit. As a result he cannot be readily substituted in case of collapse or illness.
10. Difficulties of control and the risk of mishap increases as the boat grows.
11. Diving boats must carry their air flasks and fuel tanks inside of main hull. Apart from reducing the space available for living quarters the risk of explosion from gasolene leakage is great.
12. Diving boats are habitable only for short periods and are uniformly accompanied by "mother ships" which provide the needful accommodations for the crews.

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13. Diving boats, because no one can be allowed on deck in rough weather, cannot be anchored in a seaway, and should their power of propulsion fail for any reason they are placed at the mercy of wind, wave and tide.
14. Because of trim by bow and motion of boat even at considerable depths, it is very difficult and frequently impossible to conn a diving submarine through her periscope when running submerge l. The long-tubed instruments required for such craft involve optical difficulties which make normal sight—save for very limited fields of view—and unclouded vision generally unattainable, especially in dim lights and rough water.
15. As a partly reliable craft for operations in relatively shallow waters, the diving boat up to date has been successful only to a limited degree and then only in sheltered and land-locked waters.
16. As a military instrument—in the face of an enemy and under the probable conditions of sea and such service—the diving marine has shown but little promise of achievement as a mobile base for the successful discharge of torpedoes.

With the record of risks run and disasters suffered by the diving submarine in America, in France, Great Britain and Russia, is there not the amplest reason for serious official consideration of boats of the even-keel or submerging type? There is no doubt, whatever, that the submarine has come to stay and will be developed to the same degree that the surface torpedo boat has since its inception; and there is the amplest warrant for unbiased examination of both the diving submarine and the even-keel boat so that a thoroughly efficient craft may be developed, capable of the maximum powers of offence combined with the utmost reasonable margin of safety for the men that must man them in times either of peace or of conflict.

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CONTENTS.

Fire from Coast Defences at Ships. Translated from "Mitteilungen über Gegenstände des Artillerie- und Geniewesens," of October, 1906. Communicated. 175

"Journal des Sciences Militaires." Précis of contents by Lieut. C. O. C. Hunt, R.F.A. 183

"Mitteilungen über Gegenstände des Artillerie- und Geniewesens." Précis of contents by Lieut. R. K. McGillycuddy, R.F.A. 184

"Organ der Militärwissenschaftlichen Vereine." Précis of contents by Lieut. C. O. C. Hunt, R.F.A. 185

"Streffleur's Militärische Zeitschrift." Précis of contents by Lieut. C. O. C. Hunt, R.F.A. 185

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Fire from Coast Defences at Ships.

By W. STAVENHAGEN, late Captain, Prussian Army.

Translated from "Mitteilungen über Gegenstände des Artillerie- und Geniewesens," of October, 1906.

Communicated.

In the present state of international politics it would be superfluous to dwell upon the immense military and national importance of an efficient system of coast defence, both active and passive. No great nation can afford to dispense with such a guarantee of the integrity of its sea frontiers. This has once more been demonstrated by the wars between China and Japan, Spain and America, and by the recent war in the Far East. Even a nation which relies principally on the strength of its navy must prepare for war in good time by building permanent coast defences. For these, when rightly used are valuable for offence as well as for defence. Germany, who has inscribed the word *Weltpolitik* upon her banner, is gradually recognizing that a complete system of coast defence is essential to participation in the affairs of the world, and is beginning to make up her deficiencies in this respect.

Cost of Defences:—

It is too often forgotten that the cost of bringing the defences of the whole German coast up to date would not exceed the price of a modern battleship.

In this essay it is proposed to deal only with the principal feature of a system of coast defence, namely the coast battery. Attention will be directed principally to the Artillery armament, its fire tactics, and its fire effect, touching only lightly on the question of fortification. The action of the defending fleet and its support by the batteries will not be considered in the present article.

Coast Artillery:—

The principal object of the defences of a coast battery (including both close-defence and distant-fire works) is to afford protection to the permanent emplacements of the Coast Artillery. This Artillery must have a large field of fire and a high rate of fire; it must be powerful, yet capable of being quickly handled; it must offer a small target, and must always be ready for action. For a relatively small number of coast guns will have to engage moving ships carrying a large and well protected armament; they must therefore be capable of rapidly changing their target and of penetrating thick armour. The Naval guns opposed to the battery will consist of heavy and medium high velocity guns, firing armour piercing shell, common shell, occasionally shrapnel, and sometimes but rarely high-explosive shell. To these the coast battery will oppose guns firing armour-piercing shell for use against armoured sides, belts, decks, and turrets; common shell and high-explosive shell, and shrapnel, which are very effective against men working on deck and against the unarmoured portions of the ships. An abundant supply of all these projectiles must be available in close proximity to the guns. And, last but not least, the coast battery must be fully equipped with well protected appliances for laying, range-finding, and observing, and with lights for illuminating the field of fire.

The coast guns will consist of heavy and medium guns of the same calibre as the guns of the battleships and armoured cruisers; since they have the same duties to perform. The calibre of these guns will be from 9·2″ to 12″; their length will be at least 40, sometimes even 50 calibres. These guns are intended to engage the Naval guns, and to pierce armour at the extreme range of which they are capable. Light guns which cannot pierce armour are incapable of defending the entrance to a harbour, and are useless against the enemy's rapidly moving cruisers, which will fight at extreme ranges owing to the weakness of their armour.

Heavy Guns:—

The 9·5″ and 12″ guns constitute the backbone of the defence, and will be mounted at the most important points. They range up to 9½ miles. Since their projectiles will rarely strike at right angles to the surface of the armour, but usually at a more or less acute angle, they must have a considerble surplus of penetrating power in hand. This entails the use of heavy charges of smokeless powder, either nitro-glycerine or guncotton powder. This powder must be slow burning in order to obtain high velocities with relatively moderate pressures at the breech. This again necessitates

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the use of gun-steel of high tensile strength and high elastic limit. The gun must be long and have strong but quickly operated breech closing gear.

Krupp Guns:—

The Krupp guns have given excellent results. These are built up guns, not wire wound, of Krupp special steel. This is crucible cast nickel steel, tensile strength 45 tons per square inch, elastic limit 25 tons, elongation 15 per cent. The guns are capable of withstanding chamber pressures up to 20 tons on the square inch. They have the Krupp wedge breech with repeating trip-lock and fire metallic case ammunition. The Krupp 9·5″, 11″, and 12″ guns are 45 calibres long; the 1901 patterns (now improved upon) ranged, at 15 degrees of elevation, 8½, 9¼ and 9¾ miles respectively. The 12″ gun is capable of penetrating any existing armour at ordinary fighting ranges.

The Krupp 40 calibre 12″ gun, on central pivot mounting, has a charge of 290 lb. tubular powder, and fires shells of 770 lb. or 980 lb.; M.V. 3025 fs. or 2700 fs. respectively, M.E. 49,500 foot tons or nearly 1,000 foot tons per ton of gun. These shells are steel common, semi A.P. and A.P. with or without cap. The steel shrapnel contains 1910 or 2,775 bullets respectively. The extreme range of this gun at 44° elevation is 12¼ miles, at which range the greatest height of the trajectory is 42,000 feet; but the mounting only gives 22° of elevation and 4° of depression. The penetration of the 980 lb. projectile, striking normally, without cap, is:—

Against wrought iron at 1,100 yds. 51 ins.
„ „ „ 3,300 „ 43 „
Against steel at 1,100 yards, 35 inches.
„ „ „ 3,300 „ 30 „

With cap:—

Against K.G. nickel steel, 1,100 yds. 20 ins
„ „ „ „ 3,300 „ 17·5 „

These are actual, not theoretical results. The possession of such a gun as this is calculated to inspire the defender with confidence, especially as the accuracy is remarkably good.

The mean vertical error at 2,750 yards is 11·4 inches; 50% of shots are contained in a vertical rectangle 19·2 inches high and 8·25 inches wide. It is to be supposed, however, that these latter figures represent the result of a specially successful manufacturer's trial.

Of course the weight and cost of this gun are high; but weight is of little consequence in a coast gun. The gun weighs with breech action 50 tons, the mounting 232 tons.

German and French Guns:—

It is to be regretted that Germany possesses but few 12″ coast guns; most are of 11″ calibre. But the French Coast Artillery are still more behind the times. Their regulation coast gun, for use against armour, is the 9·2″ forged steel built up gun. They have also cast steel built up guns of 9·5″, 10·6″ and 12·5″ calibre, but these are old guns, far inferior to the Krupp guns of the same calibre.

Russian Guns:—

Russia has 10″, 12″, 6″, 9-pr. and 2·24″ guns and 11″ and 9″ howitzers. At Port Arthur 119 of these guns and howitzers were mounted in 21 batteries.

Armament of Battery:—

The number of guns to be mounted in a coast battery depends upon local considerations such as the importance of the harbour, the nature of the ground, the amount of support to be expected from coast defence ships and gun-boats, the probable strength of the adversary, and the amount of money available. For instance, one 11″ gun costs as much as seven 6″ or twenty 3″ guns.

We have also to consider the rate of fire, and the weight of projectiles that can be directed upon a target in a given time. Thus a 9·5″ gun fires only 2·75 aimed shots per minute, the 11″ gun 1·5 shots, and the 12″ gun 1 shot.

This works out to a total weight of metal discharged in two minutes, at unaimed fire, of 1 ton from one 11″ gun, 3·9 tons from seven 6″ guns, or 7·25 tons from the twenty 3″ guns, for the same initial expense of armament.

The rates of fire are taken at 1·5, 5·5, and 26·5 rounds per minute respectively. The weight of metal discharged is roughly in the proportion of 1: 4: 7.

If we take the striking energy as a measure of effect the comparison is more favourable to the heavy gun; we find that it takes two 6″ or three 3″ guns to deliver the same weight of blow in a given time as one 11″ gun.

In practice it will be found desirable to observe the same proportion between the number of guns of each calibre as has been found to be the best in the Navy. This of course is subject to local conditions, to the strength of the probable antagonist, and to the support afforded by our own ships.

Ammunition:—

The ammunition to be stored in the coast battery may be reckoned at 100 to 125 rounds for each heavy gun. Of these rounds ⅓ to ½ will be A.P. shell, ⅓ common shell, and ⅙ to ⅓ shrapnel.

Armour:—

If the coast guns are to be protected by armour (which depends on local conditions, such as the height of the battery) then, in Germany, our practice is to mount heavy guns in pairs in chilled cast iron cupolas. These are well adapted for resisting heavy projectiles, since there are no bolts or rivets to fly about. Two-gun cupolas are cheaper than single-gun cupolas, and considerably cheaper than hoods of rolled and hardened nickel steel.

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Cupolas can be traversed as quickly as these guns can fire; thus an 11″ gun cupola weighing 850 tons can be traversed by hand through a complete circle in 3½ to 4 minutes. This rate of traverse is sufficiently rapid to engage even a torpedo boat passing at full speed, to say nothing of ordinary targets such as battleships. Even if 6 minutes be assumed as the time for a complete revolution of the cupola, this gives only one second per degree of traverse.

Medium Guns:—

The bulk of the armament of coast batteries usually consists of 6″ and 4·7″ guns. At medium ranges these are especially suitable for engaging rapidly moving ships, owing to their high velocity and rate of fire. They are capable of penetrating thin amour. They are also useful for protecting mine-fields and booms, repelling close attacks, and preventing small vessels from approaching to sweep for mines. The latter duty will be performed in combination with the light guns. The 6″ is preferable to the 4·7″ because its shell and its shrapnel are far more powerful, although its rate of fire is only 6 rounds per minute as against 12 for the 4·7″. This gives a slightly greater weight of metal per minute discharged by the 4·7″; but this small advantage is outweighed by the greater striking energy of the 6″ gun.

The Krupp 6 inch Gun:—

This gun is 40 calibres long, and fires projectiles of 90 lb. weight including shell, semi A.P. shell, A.P. shell with and without caps, and shrapnel containing 800 bullets. It ranges 8½ miles at 21 degrees elevation with a charge of 28·75 lb. tubular powder. The M.V. is 2,900 fs., M.E. 5,200 foot-tons.

Striking normally to the plate, the shell will perforate an 8·3″ face-hardened nickel steel plate at 1,100 yards, or a 6·3″ plate at 3,300 yards. At 2,750 yards 50% of the shell are contained in a vertical rectangle 55″ high and 40″ wide. An 112 lb. A.P. shell has recently been made for this gun: this will penetrate an ordinary steel plate 11″ thick at 3,300 yards; or, with a cap, it will penetrate a face-hardened nickel steel plate at 3,300 yards.

These medium guns will usually be mounted at about the same height as the upper deck of a battleship, giving angles of impact nearly normal to the armour. But where the armour piercing effect of these medium guns is insufficient they must be assisted by the heavier calibres.

Ammunition for Medium Guns:—

This may be reckoned at 500 rounds per gun, including ½ common shell, ¼ to ½ A.P. shell, and ¼ to ½ shrapnel.

Armour for Medium Guns:—

These will usually be mounted singly in turrets or hoods of rolled nickel steel. These give sufficient protection and are light and handy to traverse which is necessary when engaging torpedo boats. It is undesirable to mount these guns in pairs, but this is sometimes done to save expense.

Light Guns:—

A certain number of light Q.F. guns will be required. The duty of these is to engage torpedo boats, repel landing parties, and protect minefields; they may also be used at close quarters against men on deck. They are sometimes mounted to sweep the fort ditches.

These light guns are mostly of 2·24″ and 3·46″ calibre, firing 45* and 20 shots per minute respectively. The 3·46″ shells will penetrate the sides and boilers of torpedo boats at 1,650 to 2,200 yards.

Ammunition for Light Guns:—

A liberal supply must be provided, since a gun will fire away 200 to 225 rounds in a five minutes fight. A fair allowance is 1,000 rounds per gun, of which ⅔ should be shrapnel and ⅓ common shell.

Mountings and Armour for Light Guns:—

These guns are always mounted singly, usually on disappearing mountings, so that they may be reserved for the final stages of the fight. The shields must be light and handy and must offer a small target; they should therefore be of nickel steel plate.

Coast Howitzers:—

These are of the greatest importance. Flat trajectory guns are unable to pierce armoured decks on account of the acute angle of impact, even when firing from high sites at angles of depression. Neither can they pierce the roofs of turrets, which offer very small horizontal targets. Howitzers, on the other hand, are able to piece armoured decks, to attack the engines and the vitals of a ship, to drive shells through her bottom, to prevent her from manœuvring and from anchoring even at extreme range.

The Krupp Howitzer:—

The best weapon for this purpose (at least in Germany) is the Krupp 11″ howitzer, 12 calibres long. This howitzer has a charge of 28·5 lb. smokeless powder and fires steel shell, semi A.P. and A.P. shell weighing either 470 lb. or 760 lb. and shrapnel weighing 470 lb. and containing 1,880 bullets. The range of this howitzer at 43° is 6¼ marine miles. The 470 lb. shell has a M.V. of 1,400 fs., M.E. of 6,300 foot tons, and penetrates a horizontal steel deck 3·8″ thick. At shorter ranges the penetration is greater. Thus at 6 miles, with 60° elevation, the 470 lb. shell penetrates a horizontal armour plate 5·2″ thick, and the 760 lb. shell penetrates 6·7″; Whereas the thickest armoured decks are not more than 5 inches, more usually 3·5 inches, often only 3 inches thick.

The accuracy of the Krupp howitzer is very good, and, at anchored targets, is

* Probably a printer's error in the original for 25, *see* 225 six lines below.

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better than that of the heavy guns. Thus even at the extreme range of 7 (English) miles the 50% rectangle is only 58 feet long by 19·5 feet broad. (This result was obtained with a special charge giving a M.V. increased to 1,420 fs.).

These howitzers are cheap to mount since they require no shield protection, except when they are mounted so as to be capable of direct fire at close quarters. They are fitted with illuminated night sights and electric firing gear.

The 470 lb. shrapnel contains 1,880 bullets, 130 of 3·03 to the pound, 570 of 9·1 to the pound, and 1,180 of 17·5 to the pound.

Number of Howitzers:—

Owing to their comparatively slow rate of fire howitzers should be mounted in batteries of 4. For the defence of a harbour at least two such batteries, preferably four, will be required.

Ammunition for Howitzers:—

This may be reckoned at 100 to 125 rounds per howitzer, of which half should be A.P. and semi A.P. shell; the other half should either be all common, or equal proportions of common and shrapnel.

Command Posts, Rangefinders, and Searchlights:—

At least two armoured command posts must be provided for each coast battery. Rangefinders should be preferably of the D.R.F. type. Electric lights must be provided in sufficient number to illuminate the field of fire. All the above must be in nickel steel armoured cells.

Ships considered as Targets:—

Ships constitute both vertical and horizontal targets; this is the reason why both guns and howitzers are required to attack them. Up to the present ships have been built to the following dimensions:—

Displacement 10,000 to 15,000 tons.
Draught 23 to 28 feet.
Length 325 to 425 feet.
Breadth 65 to 75 feet.
Freeboard 16·5 to 23 feet.

Besides the side of the ship, the deckhouses &c., rise to about 50 feet above the water line, giving a vertical broadside target of about 11,000 square feet. The speed has hitherto been 15 knots, or 25 to 30 feet per second.

But in future ships will be built of 18,000 to 20,000 tons displacement, with speed of 18 to 20 knots. The total broadside target offered will be larger in spite of the present tendency to reduce the deck hamper in order to afford a better field of fire for the ship's guns.

Battleships have a complete water-line belt and a central armoured citadel. The armour is 8 to 12 inches thick and is of nickel steel, glass-hard on the face. The belt armour extends from 7½ feet above the water-line to 5 feet below it. The armour for the heavy gun turrets is of the same thickness as the belt; medium guns are shielded by only 4 to 6 inches of steel.

There is a tendency to provide side armour below the belt in order to provide more perfect protection for the engines and to keep out torpedoes. Hits below water might, if they did not sink the ship, cause such a list as to prevent the guns from being worked. But this additional side armour has to be provided at the expense of the armour on the protective deck and on its sloping sides, which is reduced in thickness. The lower deck and gun-deck are now no longer armoured. This is all in favour of the coast howitzers. Only the portion of the upper deck which serves as a roof to the most important casemates is armoured; the armour here is 10" to 12" thick. The weight saved on the decks is used to strengthen the belt and the armour of the citadel and casemates. Great attention is paid to the protection of the conning towers, and these are so constructed as to offer the smallest possible target. When the limitations of the total displacement render it necessary to save weight on the armour, the saving is effected at the expense of the armour of the gun turrets. For a hit which penetrates a turret is less serious than one which disables a conning tower or penetrates to the vitals of the ship. And turrets are comparatively small, and their shape is unfavourable to the penetration of projectiles. Nevertheless the turret armour must be at least 12" thick to resist 8" and 10" guns; but even this thickness will not keep out 12" A.P. shell, though it will keep out semi A.P. shell of all calibres. But in the new 18,000 ton battleships the turret and barbette armour will probably be not less than 14 inches thick.

In recently designed ships the space between the double bottoms is increased, in order to give additional protection against mines and torpedoes. This increased spacing extends from the bows at least to the fore stokehold, inclusive.

The heavy guns are mounted on the upper deck in turrets. They are in pairs, in order to utilize fully the restricted fore-and aft space, and in order to reduce the area of target offered. These turrets are pactically proof against heavy A.P. shell over 4,400 yards. France continues to use the original revolving turrets with high armoured walls, although this entails the revolution of a heavy mass of metal. Other nations use barbette turrets.

Medium guns are also mounted in pairs in turrets. The long muzzles of these guns project from the turrets and are unavoidably exposed.

Armoured Cruisers:—

These are of 6,000 to 12,000 tons displacement. They draw 21 to 26 feet of water. They are 295 to 460 feet long, have 20 to 26 feet of freeboard, and offer about the same target as battleships of the older type. Their speed is from 18 to 23 knots. These cruisers have complete or partial water-line belts, which are of 4" to 6"

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K.C. nickel steel. The armour of the turrets and casemates is of the same thickness.

Armament of Ships:—

Both battleships of the older type and armoured cruisers carry guns of different natures in the following proportions: to each heavy gun (over 9 5″) there are four 6″ and 4½ of smaller calibre down to 3″. They carry no howitzers.

Torpedo Boats:—

These attain a speed of 26 knots, or in the case of destroyers, up to 32 knots. The coast guns (at least those of small and medium calibres) must be so mounted that they can follow these rapidly moving targets.

Naval Tactics:—

Setting aside blockade tactics, which are of a more or less passive nature, the ships may attack the coast forts in two ways. The first is a regular Artillery attack on the forts, often combined with a bombardment of the harbour. The second method consists of a dash past the forts into the hardour. In either case the ships will be in rapid motion during the whole attack. There will be little or no attempt at methodically bombarding the forts, breaching their parapets, and piercing their armour. Attempts will rather be directed towards silencing those fort guns which interfere with the operations to be carried out. Ships will gradually advance, on curved courses, with constant changes of speed and direction. They will traverse as quickly as possible the zone rendered dangerous by howitzer fire, namely from 11,000 to 4,400 yards. At points recognized as specially favourable for attack they will drop buoys, so that the range will not have to be found afresh when they pass these buoys again. The actual artillery combat will be carried on between 4,400 and 1,100 yards; sometimes, but rarely, the ships will anchor in this zone. This advance to a range at which the armour can be penetrated is both rash and dangerous; the battle will usually be decided at ranges of 3,300 to 2,200 yards.

The dash into harbour is the culmination of a successful attack.

But it may sometimes be boldly attempted at the commencement of the fight, either taking no notice of the coast batteries or continuing the dash with an attack on the batteries. The latter procedure is most difficult for the batteries to meet. The dash into harbour is made at full speed, with the greatest boldness and decision, and is pushed home even if the obstacles (booms and mines) have not already been cleared away. It is usually made in line ahead with torpedo boats leading. It is often preceded by a feint in another direction.

Fort Tactics:—

Whichever nature of attack is attempted, every gun must be brought to bear upon the attacking ships. When the forts are attacked every gun should open simultaneously. When a dash at the harbour is attempted the rate of fire should be as high as possible. Light guns should pour a storm of shell upon the advanced guard of torpedo boats, which will usually contain at least one boat intended to destroy the mines. Heavy and medium guns will concentrate on the ships. In a night attack the part played by the searchlights is of the greatest importance. They serve to discover the enemy, to dazzle him, and to hide the movements of the defenders.

Ammunition for Coast Guns:—

Heavy, common, and A.P. shell afford a high degree of effect per individual round; a storm of medium calibre shells produce a high degree of collective effect. Both are especially effective against the unarmoured or lightly armoured portions of ships, which may thus often be put out of action without piercing their armour.

The striking energy of heavy shells varies from 25,000 to 35,000 foot-tons, that of medium calibre shell from 3,300 to 4,200 foot-tons, at short ranges.

Prematures in the bore, which invariably disable the gun, were formerly a source of danger; but this defect has now been practically overcome. Common shell filled with high explosive are ineffective against well protected guns; we are at present endeavouring to get armour piercing shell with high explosive bursters to penetrate at least medium armour and to burst inside.

Thus the Americans have succeeded in getting A.P. shell filled with Maximite or Army High Explosive to penetrate 11″ Krupp plates before bursting the shells containing 59·5 lb. of high explosive; the point of burst was at the rear face of the plate or close behind it. These shells were fuzed with a safety fuze and detonator. It should be noted, however, that the velocity was under 2,100 fs., while the modern 12″ guns have muzzle velocities of 2,700 fs. Moreover the present tendency is to use armour plates of greater thickness than 11 inches.

Armour piercing shell are of chrome steel or nickel steel. Their great accuracy and penetration are due no less to their weight than to their shape; they have very long sharp points of hardened steel. They have no fuzes. They were at first loaded with powder or high explosive; but this always bursts on impact, blowing the fragments backwards and reducing the penetration. At a later period these shells were, for this reason, filled with sand and sawdust. But since the general introduction of the soft iron cap, which has increased the penetration, it has again become customary to fill A.P. shell with a powerful burster in order to increase the effect behind the armour.

Action of the Cap:—

It was formerly supposed that the cap facilitated penetration by acting as a

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lubricant. But it is now considered that its usefulness lies in supporting the hard steel point of the shell and in preventing it from breaking. As soon as this point has penetrated a few tenths of an inch into the plate the area of the surface upon which the penetrating force acts, rapidly increases; once the point has penetrated, the shell follows it. The destructive action on the point is not a melting action, but takes effect by breaking down the structure of the point and reducing it to fine powder. The iron cap prevents this reduction to powder since the particles of metal cannot escape sideways. But whatever the theory of the action of the cap, it is important in practice to obtain a cap of the right shape, accurately fitting the point of the shell and firmly connected to it, extending as far back as possible. This problem has been successfully solved, especially in America. The effect of such a cap is to increase the penetration by 15 to 30 per cent.

Armour piercing shell filled with high explosive or black powder produce satisfactory effect upon conning towers and turrets. But it is doubtful whether they can reach the vitals of the ship, since if they succeed in carrying their burster through the armour they will probably burst in the coal bunkers. For this purpose solid steel A.P. shot are required. But this question is still unsettled.

Shrapnel are used principally against boats and for covering obstacles, case-shot on the land fronts for repelling attacks and sweeping fort ditches.

Ballistics:—

The principal object is to destroy the motive power of the ship, the secondary object to destroy her fighting power. To do this requires efficient guns and an efficient system of fire discipline. As regards the efficiency of the guns, the principal factor is accuracy. This is effected both by the error of the gun and by the flatness of its trajectory—in other words, by the depth of its dangerous zone. The longer the dangerous zone at any elevation the less will be the effect of errors in rangefinding and laying, and of the error of the gun. The modern tendency is to fight at distant ranges, and it is hoped to produce decisive effect at these ranges,. And this renders flatness of trajectory still more important. A long dangerous zone means a small angle of descent; this is only obtainable with a high velocity. The length of the dangerous zone increases roughly as the square of the velocity; therefore even a small increase in M.V. means a considerable improvement in accuracy.

The increase of accuracy due to increase of M.V. reaches its limit when the 100 per cent length zone (due to error of the gun, error of rangefinding &c.), is less than the length of the dangerous zone. But this is hardly a practical possibility at long ranges.

It should be noted that flatness of trajectory is not the *only* factor upon which accuracy depends. This is shown by the fact that guns with the same degree of flatness of trajectory are not all equally accurate.

Fire Discipline:—

The object is to distribute hits to the best advantage. Theoretically the mean point of impact should be on the most vulnerable of the important points of the ships. Practically we are glad to hit the ship at all. Certainly Field Artillery are able to hit moving targets, but they are able to judge their range by features in the landscape to which the range has been measured, and so to correct their fire; while the coast gunner has only the featureless sea. A regular system of ranging as practised by the Field Artillery is impossible if only on account of the cost of the ammunition and the small number of rounds available. Rangefinding is also a difficult problem; ranges have to be measured by instruments with vertical or horizontal base. These instruments must be accurate, quick in action, and must be well protected by armour. The error of the instrument must be less than the error of the gun. Given a good rangefinder, the next difficulty to overcome is the rapid movement of the target; the laying and rangefinding appliances must enable this to be allowed for so that hits may be made with some degree of certainty upon the most vulnerable parts of quickly moving ships. In making this speed correction the time of flight of the shot has to be allowed for, consequently the correction is not the same for different natures of gun. The speed of ships under fire will vary from 3 to 23 knots, or 32 knots for destroyers.

Presuming that the gun is layed on a point in advance of the ship, then the gun must be fired at the instant that the ship comes opposite to the sights. This is possible with modern sights and electric firing gear. The layer, without moving his eye from the sights, pulls the trigger and fires the gun. The firing gear is of two kinds; percussion firing, in which the striker is released by electro- magnetic gear, and electric firing in which an electric tube is fired by passing a current through it.

The less the time required to aim, the greater the rate of fire. Therefore most modern mountings are arranged so that the layer can follow the target with the sights, without interruption, while the gun is being loaded. The gun may then be fired as soon as the breech is closed. This method of following a ship necessitates the use of the independent line of sight, one number laying while another corrects the elevation for the varying distance of the target. These variations are due not only to the direct course of the ship but to changes in speed, changes of course, and to the ship turning about.

Even the helm necessary to keep a ship on a curved course exerts a marked influence on her range and direction relative to the gun. When coast guns are mounted in revolving turrets the layer adjusts the speed of revolution to the angular

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speed of the ship, so that, as far as possible, the gun always follows the ship.

The angular velocity of a ship moving across the line of fire is as follows, per second:—

Speed.	Range in Yards.			
	550	1,100	2,200	3,300
10 knots	$\frac{3}{5}$ degree	$\frac{3}{10}$ degree	$\frac{3}{20}$ degree	$\frac{1}{10}$ degree.
20 ,,	$1\frac{1}{5}$,,	$\frac{3}{5}$,,	$\frac{3}{10}$,,	$\frac{2}{10}$,,
30 ,,	$1\frac{4}{5}$,,	$\frac{9}{10}$,,	$\frac{9}{20}$,,	$\frac{3}{10}$,,

The mechanism for revolving the turret or mounting must allow of the gun being fired on the move; it should preferably be friction gear. If the mechanism is capable of giving a complete revolution to the turret or mounting in 1 minute, this corresponds to an angular velocity of 6° per second; one turn in two minutes gives 3° per second, or one turn in 3 minutes gives 2° per second. At each gun the gun-captain keeps the sights on the target and fires when satisfied with his aim; another number keeps the sight set at the ranging elevation.

When the point of aim has been ordered and all corrections for speed and distance set on the sights, the gun is fired by the gun-captain without further word of command. The practice of laying off the tar get to allow for speed is now forbidden; all corrections are given on the sights. The following simple rule for deflection is often used. When the time taken by half the length of the ship to cross the line of fire is greater than the time of flight, then if deflection for half the length of the ship be given, the point struck will not be abaft of the point aimed at. If the speed is greater than this, the same correction may still be used, the gun being layed on an aiming point on the ship forward of the point to be struck; or a large correction may be given.

When a ship is advancing on the battery the gun is simply layed on the bow wave with the elevation due to the range at the instant of firing.

When a ship is retiring the gun is layed on the stern waterline, increased elevation being given for the distance which the ship will traverse during the time of flight plus the whole length of the ship. Sometimes the taffrail instead of the stern waterline is layed on. The battery commander orders the point to be layed on and estimates the speed of the ship. Guns (not howitzers) are always layed direct. It is necessary that the guns should have an unobstructed view over the whole field of fire, and it is desirable that they should have as much command as possible. It is also desirable that the field of fire should be as large as possible; but, with heavy guns, this advantage may have to be balanced against other considerations depending on the locality. The speed of traverse should be as high as possible. Traversing is effected usually by power, preferably electric. Elevation is effected usually by hand, sometimes by power.

Coast guns have telescopic sights in addition to the open sights. Ammunition is brought up on trollies (power or hand) and loaded usually by electric power.

Coast howitzers are layed indirect. But, especially on high sites, they are often mounted so as to be capable of direct fire on emergency. The laying, traversing and elevating gear are otherwise similar to those of coast guns.

Historical Examples:—

Little is to be learnt from modern historical instances as to the probable result of a combat between forts and ships. The success of the English against Alexandria in 1882 is discounted by the fact that the forts and their garrisons were of inferior quality. But it is important to note that after the battle the English ships had not enough ammunition remaining for a sea fight, nor had they any means of replacing it. The same thing happened at Lissa. In the Spanish-American war the Americans made no serious attack upon the forts at Havana, Portorico or Santiago. They did not wish to risk their ships. In the recent war in the Far East the Japanese never engaged the Port Arthur forts. They remembered the sea-fight on the Yalu, which had to be broken off because the ammunition was exhausted. The same thing happened at the bombardment of Callao in 1866.

It is true that on the 9th February, 1904, the Japanese ships engaged Golden Hill and 3 other batteries for 40 minutes at a range of 8,500 to 9,500 yards, but not a single hit was made on either side. After this the Japanese kept out of range.

In the days of wooden ships it may have been true that "Un canon à terre vaut un vaisseau de mer," but in those days the red-hot shot of the batteries were more effective against the wooden ships, while the fire of the latter was ineffective against the sandstone or granite breastworks.

When armoured ships were introduced the navy regained its superiority; but when the batteries were protected by armour and armed with heavy guns matters were equalized.

At the present day, other things being equal, there is certainly no advantage on the side of the ships. In fact the advantage is the other way. For the heavy guns of the ships lose their accuracy and finally become useless after firing a comparatively small number of rounds, and these guns cannot be replaced; whereas the forts can easily replace their guns, at least those of medium calibre. The ships carry only about 50 to 80 rounds per heavy gun, 100 to 200 per medium gun, and 200 to 250 rounds per light gun. This is only sufficient for a two hours fight; whereas the coast guns can depend upon a practically unlimited supply.

Relative Accuracy of Fire:—

Recent peace time experience has demonstrated that the fire from forts is far more accurate than that from ships.

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This is due to the following causes:—

Stable gun-platform.

Better system of fire-control.

Better knowledge of the field of fire.

Possibility of accurate rangefinding.

Greater facilities for observing fire, especially across the range.

This applies to howitzers as well as to guns. Moreover the coast guns will as a rule outnumber the ship guns; they are disposed in batteries of 4 to 6 guns, carefully arranged with a view to concentration of fire.

On the other hand, the accuracy of the fire of the forts is reduced by the mobility of the ships. But when a squadron intends to deliver accurate fire it is obliged to anchor, and it then offers an easy target to howitzers, which ships at present do not possess.

Suppose that a coast battery armed with 11″ Krupp guns engages a ship fighting broadside on at 4,400 yards.

The 100% rectangle of the 11″ Krupp gun is 15½ feet wide and 33 feet high at this range. Therefore the battery should put in 92% of hits. If it were armed with the 11″ Krupp howitzer, whose 100% rectangle is 315 feet long by 39·5 feet wide, the battery should make 26% of hits.

At a range of 11,000 yards the probability of hitting with the 11″ howitzer is three times as great as with the 11″ gun, provided the ship be anchored. If she be anchored bows on to the battery (the most favourable case for the battery, on account of the dispersion in depth of the shells) then at 4,400 yards the howitzer will make 100% of hits and the gun 92%; but at 11,000 yards the howitzer, at a target of this length, will make 7 to 6 times as many hits as the gun. Thus guns may be used at ships either anchored or on the move, howitzers preferably at anchored ships, and at extreme ranges.

The Coast Battery as a Target:—

The batteries offer low and scattered targets, of small depth, difficult to locate and to range upon. From an unstable gun-platform, especially when on the move, it is far more difficult to make hits than to do so from the battery. Decisive effect can only be obtained by destroying the gun detachments; to do this the ships must approach to from 3,300 to 1,650 yards. Preferably the ship should anchor in a dead angle, if such can be found; but this is the exception with well designed works. Failing this, anchoring would only be permissible if the ships were greatly superior in force.

Rangefinding from a ship is most difficult, and this will prejudice the effect of the ship's fire.

A single hit is not likely to produce a serious effect upon a well armoured fort, whereas one hit may explode a ships magazine or her boilers. Moreover the forts, being better provided with ammunition can continue the action much longer than the ships. The latter will therefore be unable to carry out a systematic attack lasting all day, but will have to trust to a dashing attack and a storm of rapid fire. They have however the advantage of being able to bring a more or less converging fire on any fort selected for attack.

Taking all these considerations into account we must conclude that ships will not be able to silence (far less destroy) strong coast batteries unless they are in overwhelmingly superior force and are prepared to expend so much ammunition as to render them unfit for a sea fight. Even so they are not likely to succeed in destroying the forts unless they land parties to attack them, covered by the fire of the ships at close ranges.

Since the main object of a fleet is to fight other ships, it will usually avoid attacking strong coast defences, or even coming within range of their guns. Such attack is only permissible when it is the necessary preliminary to a sea fight—as when the enemy's fleet have taken refuge in harbour or under the guns of the forts. In this case an engagement with the forts is only an unavoidable incident of the combat. But in this case there must be no danger of having to encounter naval reinforcements despatched by the enemy to the scene of action—unless indeed the attacking fleet is strong enough to detach a squadron to meet such reinforcements. Or, as a last resource, it may be necessary to force a passage through a channel, or to enter and destroy an important harbour, running the gauntlet of the forts to do so. This may occur as a very exceptional case when there is no work left for the fleet to do at sea; that is, when the enemy has no ships left. But usually the fleet will only have to support the attack of the land forces upon the coast defences.

High Sited Batteries:—

In conclusion we will briefly consider the effect of height above the water level upon the fire of coast batteries. Generally speaking the fire of low sited gun batteries is both more accurate and more effective; the trajectory is less plunging and the shell strike the armour more nearly at right angles to the vertical plane. Low sited batteries have less dead water in front of them and can therefore engage ships at closer ranges, and can continue their fire up to the last moment.

On the other hand observation is easier from the high sited battery and the battery is far easier to protect, especially when earthen parapets are used. Owing to the flat trajectory of their guns it is practically impossible for ships to drop shells *into* these batteries at short and medium ranges, at which the angle of descent is very small, or is even negative. Open batteries with guns firing over a parapet have a much narrower field of fire than armoured turret batteries, namely about 150° as against 360°; but this arc is sufficient in most cases.

Subject to special local conditions, the question of high *versus* low site batteries is one of protection *versus* effect, which must be combined to the best advantage.

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If, as is usually the case, full advantage is taken of available high sites, it will generally be necessary to provide low site batteries as well for covering minefields and guarding channels. Low site batteries must almost always be armoured; islands in the channel form suitable sites. High sited batteries must be so placed as to have no dead water in front of them; or, failing this, the dead water must be covered by the fire of other batteries at short range. The most modern mountings allow of 13° of depression, but 5° to 6° of depression is as much as can be given with older mountings. If extreme depression is required, this implies that the guns must be mounted high above the parapet, when they will be badly exposed. Moreover the steep superior slope of the parapet weakens the crest. For these reasons the best height for gun batteries will rarely exceed 155 feet above sea level.

Howitzer batteries should be placed as high as possible; this gives better protection and better facilities for observation. But occasionally local considerations may render it desirable to choose a low site for a howitzer battery in order to obtain better protection from the shape of the ground.

In general it will be best to mount both guns and howitzers in open earthworks. Costly armoured batteries should be employed as sparingly as possible; the extra protection afforded by armour is rarely necessary in view of the relatively inaccurate fire of the ships. The money saved by using earthworks instead of armour will be applied to the best advantage in the provision of the most modern and most powerful guns.

"Journal des Sciences Militaires."

PRECIS OF CONTENTS.

By LIEUTENANT C. O. C. HUNT, R.F.A.

January, 1907.

A criticism of the Campaign of 1815.

A reply to M. Houssaye; by M. Grouard.

The dispute at issue turns upon the responsibility of directing the movements of D'Erlon and Grouchy. Certain military historians and writers of note would impute the failure to send them the necessary orders to the fault of the Staff and to the fact that Soult, the new Chief of Staff was an unworthy successor to Berthier. The author will not have it so; and maintains that the Emperor was himself to blame. It is not the duty of the Staff to evolve operations, but to ensure that the General's dispositions are carried out; Napoleon's intervention was all the more necessary after Ligny, since the situation had become greatly complicated by the presence of two adversaries; yet it seems quite clear that the Emperor took no steps to give direct orders to D'Erlon. Nor can Soult be charged with failing to interfere with Grouchy's movements on Gembloux; it was entirely the latters affair; unless Napoleon had himself interfered. Even had Grouchy arrived at Gembloux a few hours earlier, it is extremely doubtful whether results would have been very different; Napoleon already had full information as to the movements of the Prussians; he still held to the idea that although they were at Wavre, these latter could not get up into line for several days.

It would have been quite a different story had Napoleon at 3 a.m., in the light of the information he then possessed, ordered Grouchy to join him by the shortest possible routes; by starting at 7 he could have reached Plancenoit by 4, and the Emperor warned of his approach by noon could have thrown nearly all his army against the British, and it is beyond doubt that he would have been strong enough to support the cuirassiers charge with the bulk of the guard to hurl back the British before the arrival of the Prussians.

It was negligence however on Soult's part in not informing Ney as to the result of the battle of Ligny; but he cannot be held blameworthy in sending the letter to Grouchy he did at 10 a.m., on the 18th, urging the latter to march on Wavre and join up communications with the Emperor; it should certainly have ordered an earlier arrival, but for this Napoleon is responsible: some maintain the bearer of this letter was drunk.

In short the shortcomings of the Staff were of little consequence in the results. Similarly their faulty dispositions and the desertion of some to the enemy cannot

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be considered as contributory causes of the disaster. Had Grouchy marched to the field of battle on the 18th he would certainly have made victory incline to the French arms, but there was nothing to cause him to do so, which fact Napoleon himself recognized and even at 10 a.m., directed him upon Wavre, although he knew that he would find the Prussians there.

Starting with the fundamental distinction between strategy and tactics, we may say that positive strategy has as its object the sum total of definite rules to which should be subordinated the conception and execution of great military operations, outside the battlefield. In applying them, other things being equal, the chances of victory are increased; by violating them they are diminished but not annulled because victory depends upon the causes.

Observing principles is one thing, moral force another. If Napoleon, understood moral force better than anyone, it is quite certain that he also had principles of positive strategy. It might even be said that what distinguished him from almost all his contemporaries is that he had very precise notions upon the method of conducting a campaign. Many other Generals showed considerable skill, in particular circumstances, but were deficient in general principles. A solitary exception is found in the Archduke Charles; he had Napoleon's principles but not the same genius in applying them.

The soldiers of the Revolution.

A study in practical military sociology. The social importance of the military part of the revolution.

Chapter I. Revolutionary France and aristocratic Europe.

i. War, struggle of principles.

ii. War, national struggle.

iii. The convention driven into a duel to the death.

iv. The moral superiority of France.

(To be continued).

Some thoughts on medical arrangements on the eve of battle.

Questions discussed at a medical conference held in Toulouse, 7th August, 1906. By Dr. Berthier, Principal Army Surgeon. (To be continued).

A question of tactics.

Problem set at the Higher Ecole de Guerre, entrance examination in 1907; with map. This tactical problem is thoroughly discussed and a solution worked out.

Instruction of infantry cadres. By Lieut. Balédent, 104th Regt.

Musketry instruction in the infantry; being stray notes of a company commander. By A.B. (To be continued).

Military notes of the month.

Treats of the psychology of the modern battle.—The re-generation of the French nation by the army.—The proposed reform of the military penal code.

Publication.

"A Philosophical Study on the Art of War"; by Captain Gamelin, orderly officer to G.O.C. VIth infantry division. Published by Chapelot, Paris.

"Napoleon I. at the camp at Boulogne." From various unedited documents; by M. F. Nicolay. Published by Perrin, Paris.

"The Siege of Port Arthur" by Colonel de Grandprey, French Engineers. Published by Berger-Levrault, Paris.

MITTEILUNGEN ÜBER GEGENSTÄNDE DES ARTILLERIE- UND GENIEWESENS.

PRECIS OF CONTENTS.

BY LIEUTENANT R. K. McGILLYCUDDY, R.F.A.

No. 2, 1907.

Extract from "Field works as influenced by the wars in South Africa and Eastern Asia."

Concealment of Artillery.

Artificial concealment for guns played only a minor part when compared with the measures adopted for the concealment of infantry, which is exposed not only to the fire of guns but also of rifles.

Artillery found its best means of protection in rendering difficult or entirely preventing observation on the part of the opposing Artillery, and concealed positions became the rule.

In spite of that it became usual to dig pits to protect the personnel of a battery during any pause in the fire.

The Japanese also made use of vertical shrapnel shields placed *only in concealed positions* a few yards in front of the guns.

The universal introduction of shields will alter matters but little as they are not proof against a direct hit, and some of the detachment are still exposed to the shrapnel bullets.

Protection in the nature of pits will have to be resorted to in the case of a strongly maintained shrapnel fire and screens can be used with effect in concealed positions.

If the guns have to be placed in the open it is well to remember that they should be sunk as far as possible below the surface so as to render them inconspicuous.

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Organ Der Militärwissenschaftlichen Vereine.

PRECIS OF CONTENTS.

Translated by LIEUTENANT C. O. C. HUNT, R.F.A.

V. (Concluding Number), 1906.

On the use of Artillery armament in large modern fortresses. A consideration of the following questions:—

I. How is the defensive matériel distributed?

II. It is possible to attain the results which every vigorous defence must strive for, with this distribution.

III. When, and within what area must the reserve armament of the fortress be placed so as to avoid an undue dispersion of the latter but at the same time ensure superiority of fire in the Artillery action.

By 1st Lieut. J. Hanika, on the Austrian General Staff.

Stories of Rovereto and the Lager valley. A lecture delivered in Innsbruck, by Staff Surgeon, J. Plahl.

The postmaster of St. Menehould. A tale of the wars of the French revolution, 1790-1801. By Col. C. von Duncker.

The truth about Port Arthur. A review of the Russian General M. J. Kostenko's book, lately published in Kieff.

"The Siege and Surrender of Port Arthur."

Military publications.

The sea as the source of sea power and national greatness. A notable article by Capt. "D." in the September number of the "Die Militarische Wett."

The Russo-Turkish war of 1768-1774. By Captain R. Ungermann; published by Braumüller, in Vienna.

From Leipzig to Erfurt, the pursuit of the French army in 1813. By H. Kerchnawe.

The mechanical train of steam traction engines. Their suitability for an army in peace or war. By Lieut.-Col. O. Layriz. Published by Mittler and Son in Berlin.

On the military importance of mechanical transport. By Capt. W. Stavenhagen.

The grand (Kaiser) manœuvres in Silesia of 1906, with sketches; published by Seidely and Son, Vienna.

Streffleur's Militärische Zeitschrift.

With which is incorporated,

Organ Der Militärwissenschaftlichen Vereine.

VOLUME I.

PRECIS OF CONTENTS.

Translated by LIEUTENANT C. O. C. HUNT, R.F.A.

No. 1, January, 1907.

Field Marshal Mack. By Capt. Criste.

On infantry shooting. By C. R. von Steeb.

The grand manœuvres of foreign armies in 1906.

France, Italy, Great Britain (the concluding manœuvres round Brighton), Russia, Sweden, with maps and sketches.

Light field howitzers, descriptive account of the equipment of various foreign powers with a short account of the development of the field howitzer; the following equipments are described:

Austro-Hungary.

10 cm. (3·94") M 99 Field Howitzer.

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Common shell weighing 32·3 lbs. Shrapnel shell weighing 28 lbs. M.V. 951·2 f.s. (full charge). 6 different charges can be used with common; shrapnel may be used either with full charge or charge number 3.

Maximum range for common shell, fused with time is 6220 yards.

Maximum range for common shell with percussion is 6775 yards.

Shrapnel with time fuze, 6112 yards.

Shrapnel with percussion fuze, 6505 yards.

The gun weighs 19½ cwt. roughly, weight behind the team 36½ cwt., including 5 men, 43¾ cwt.

The "A" tube is of bronze.

The maximum elevation that can be given to the howitzer is 42° 30′, depression 10°.

The limber is divided into 9 compartments holding 21 rounds besides stores; seats for 3 men are provided.

The wagon limber is identical with the above, and contains 21 rounds, the wagon body 30 rounds in 10 compartments, making a total of 51; its weight carrying shrapnel, amounts to 36 cwt; common shell 37·6 cwt.

Projectiles are of 3 sorts, shrapnel, common, and high explosive, the latter being filled with ammonal.

The cartridge is contained in a brass case holding 6 seperate charges, provided with a lid; full charge consists of 10¾ oz. of flaked powder ·07″ thick.

Sighting, tangent and steel graduated arc sights.

Each battery has:—

6 six horse howitzers.
12 ,, wagons.
1 ,, supply wagon.
1 four horse store wagon.
4 pair horse wagons for rations.
1 four horse baggage wagon.

Divided into:—

The firing line—6 guns (3 shrapnel and 18 common shell), 126 rounds.
The first wagon line—3 wagons (3 common and 48 shrapnel each) = 153 rounds.
2nd line—3 wagons each with 3 common and 48 shrapnel; 3 wagons each with 33 common and 18 shrapnel = 306.
3rd line—3 wagons each with 3 common and 48 shrapnel = 153; 1 ration wagon.
Train—1 store wagon; 4 supply wagons.
Baggage—Baggage wagon.

Making a total of 738 rounds per battery (234 common, 504 shrapnel), i.e.: 39 common and 84 shrapnel, or 123 rounds per gun.

The unlimbered howitzer (19½ cwt.), is lighter than the field gun and only requires a detachment of 5 men—the latter 6. The equipment travels well in draught, its stability is great for the gun is low and the track 5′ wide. Length of the firing battery column on the march is 234 yards, or together with the various wagon lines and other vehicles 340 yards.

The angle of opening of shrapnel cone at 2180 yards is about 17½°; the beaten area measures 60 yards long by 18½ yards wide at this range.

Experiments against the following targets at a range of 2,200 yards shewed with

40 extended infantry—64 hits.
22 standing infantry—22 hits.
6 lying infantry—6 hits.

By setting the fuze at "acceleration" the shell eplodes at a distance of 294 yards from the muzzle, the beaten rectangle is then 330 yards to 545 yards long; when set at "case" distance the burst is only 5½ yards to 11 yards in front, covering a depth of 327 yards. In each carrier is one shrapnel fuzed at "case" and two at "acceleration."

Percussion shrapnel is capable of destroying any walls or light breastworks likely to be met with in the field, it explodes on the far side.

Common shell with fuzes give a very large cone of dispersion, and an angle of opening of 160°—180°; the pieces into which the shell is broken up are thickest near the circumference, but the space round the axis is not unduly thinned. The angle of descent of the fragments is very steep, those in the lower are falling almost perpendicularly, the dispersion is also very great. The drawback is the small effect in depth, thus requiring great accuracy to be efficacious.

With trained detachments a rate of 5 to 6 rounds per minute can be attained with careful laying; by using "accelerated" fuzes 7 to 8 rounds per minute.

The howitzer is extremely accurate in shooting.

On military aëronautics and the employment of balloon sections in Silesia in 1906.—By Lieut. Frh. V. Berlepsch.

The Russo-Japanese war. Opinions and observations by combatants. The infantry of the I. Japanese army in the campaign against Russia. Leading and fighting methods. Carrying out the attack. Night operations. By Major A. v. Dáni.

Foreign military intelligence.

France. The 1907 military budget.

Italy. Railways.

Russia. Re-organisation of the General staff. The distribution of engineer brigades. Miscellaneous items.

Naval news.

Two French engineers Lalande and Devaux, have succeeded in building a submarine which requires no crew; it is in the form of two cigar shaped cylinders, one over the other; it is driven by electric accumulators equal to 100 hp., and attains a sped of 17 knots.

Technical notes.

Germany. Germany is adding to the fortresses in Breslau.

France. One of the forts at Besancon was blown up a little while ago by an explosion in a powder magazine.

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England. Forts in the neighbourhood of Gravesend are to be dismantled.

Sweden. A commission is to give an opinion in 1913, as to whether the line of forts forming one of the country's lines of defence should be rebuilt or strengthened.

U.S.A. Projects for coast defence.

Japan. Fortresses are to be built in Corea.

Automobilism.

The firm of Erhardt, are exhibiting an armoured car at the Berlin motor car exhibition, which is especially designed to follow up a balloon; it is covered with 1·4″ plating and armed with a 5 cm. (1·95″) quick-firer, which can be given an elevation of 70° and can fire 24 rounds per minute; 102 rounds of shrapnel only are carried; its crew consists of 1 driver and 3 others.

It is driven by 4 cylinders, hp. 60; a speed of nearly 26 miles per hour is attainable.

At Milan two new mechanical trains were exhibited, designed by Cantono and Novaretti. respectively.

Intendance and Medical news.

Literary notices.

Six months with the Japanese army. By Major Bronsart v. Schellendorf. Published by Mittler & Son, Berlin.

No. 2, February, 1907.

The operations against Borgoforte in 1866; by Capt Moosbrugger, with sketch map.

The Cavalry battle; by G. A. K. Gaudernak, with sketches.

Musketry practice under service conditions, carried out by the unmounted troops of the IX. corps near Benátek. By Col. K. E. v. Langer and Capt. E. Kreneis.

Grand manœuvres of foreign armies in 1906.

France, Balkan States, Switzerland, Belgium. With maps.

Light Field Howitzers.

The German light field howitzer has a calibre of 10·5 cm. (4·15″), firing:—

Common shell, weight 34·4 lb. Shrapnel shell, weight 28·6 lb. Initial velocity 963 fs. to 1,074, muzzle energy 228 foot-tons to 232 foot-tons. Maximum range.—With time fuze, 6,100 yards, with percussion fuze, 7,630 yards.

The howitzer weighs 21½ cwt; weight behind the team, 2 tons nearly, it is made of nickel steel. The rifling consists of 32 grooves having right handed twist increasing from 1 in 35 to 1 in 15; its length is 11·9 calibres, and its weight 8½ cwt., or with elevating gear 9¼ cwt.; the maximum elevation that can be given is 40° and 10° of depression; the ordinary means of checking recoil is by means of brakes; a spade can also be used in addition if necessary.

The gun limber opens at the back and is divided internally into shell compartments on either side of a central division for stores; the two former hold 6 ammunition carriers each with 2 rounds and 2 cartridges total 24: 3 men are carried on the limber. The wagon limber carries 26 rounds; the wagon body is divided laterally, and carries 32 rounds.

The cartridge case is of brass; the charge consists of 370 grammes (13 oz.) of nitroglycerine in seven bags, this forming the full charge any number can be taken out and the charge thereby reduced.

The battery consists of:—

6 six-horse guns.
6 six-horse ammunition wagons.
1 two-horse supply wagon.
1 four-horse forage wagon.

Divided into—

6 guns and 3 wagons forming the firing battery.

3 wagons and 1 store wagon forming the 1st line.

1 store, supply and forage wagon forming the baggage line.

The amount of ammunition carried is as follows:—

Firing battery.—		
6 guns (each 24 shrapnel)	144	
3 wagon limbers (26 shrapnel) ...	78	
3 wagon bodies (32 common)	96	318
1st wagon line.—		
3 wagon limbers (26 shrapnel)	78	
1 store wagon limber (26 shrapnel)	26	
3 wagons (32 shrapnel)	96	200
	Total	518

The light field howitzer divisional ammunition coulmn carries 406 rounds per battery: the army corps ammunition column an additional 423 rounds: making a total of 518+406+423⅓=1,347⅓ rounds per battery or 224½ per gun.

The weight behind the team of the howitzer with detachment mounted is 46·6 cwt.

The ammunition wagon with detachment mounted 48 cwt. (nearly).

The length of column on the march is about 400 yards; this includes 1st line of wagons and part of the light ammunition coulmn.

Common shell. When firing against cover a charge ensuring an angle of descent of not less than 30° is used; thanks to the seven different charges effect against overhead cover at ranges over 2,300 yards can always be depended upon; below this range owing to the small angle of descent results are not so certain. The effect of burst is greatly increased by the use of "delayed action" fuzes.

Against vertical targets percussion fuzes are used, time against living targets behind cover, the maximum opening of the cone of dispersion amounts to 200°, and is much more effective than that of the field gun by reason of the greater bursting charge and the number of pieces it breaks up into.

Shrapnel. Shrapnel is inferior in effect to that of the field gun especially at shorter ranges; it is only used with full charge.

The angle of descent and dispersion of

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bullets are always larger than that of field gun shrapnel; at high angle fire the mean length of dispersion is 38 yards.

Four to six rounds per minute is the usual rate of fire; the supply of ammunition thus lasting for 4½ to 5 hours continuous fire.

England. The 5″ B.L. howitzer is described.

France. The 4·75 short gun used as a howitzer; it is supported by a cradle and firing a shell 34·6 lb. in weight filled with melinite fuzed for percussion, and a shrapnel of the same weight with time and percussion fuze.

Initial velocity 950 fs.

Three charges are used with common shell; maximum range; with time fuze 5,290 yards, with percussion 6,220 yards.

Weight behind the team of the gun and limber, with 16 rounds in the latter is 46½ cwt., or 53 cwt. with detachment (4 men) mounted.

The fully equipped ammunition wagon with 16+32=48 rounds and a detachment of 4 similarly amounts to 53 cwt.

There are 6 guns and 9 waggons per battery carrying 240 common and 288 shrapnel = 528 rounds.

Italy is still without a field howitzer.

Russia, the first to introduce this nature of field ordnance, has the 6″ field mortar, firing common shell 59·4 lb. and a 63·25 lb. shrapnel: initial velocity 758 fs. and 720 fs. respectively. The maximum range is 3,720 yards for both shell. Besides full charge, a quarter and half charges can be used.

The gun fully equipped with 12 rounds in the limber gives a weight behind the team of 41·5 cwt., of with the detachment of 4 men mounted, 48·5 cwt.

The wagon, carrying 12+14=26 rounds and 6 men, 46·8 cwt. In addition there are two wheeled ammunition carts to carry two shells each time from the wagon line to the battery.

There are 6 guns, 18 four-horse wagons and 6 pair-horse carts per battery, carrying 378 shrapnel and 174 mine shells=552.

A field howitzer is to be introduced.

All these last mentioned guns partake, by reason of their greater weight, of more of the nature of guns of position.

England, France and Italy contemplate the adoption of new howitzers and Russia is designing one.

Then follows a sketch of a modern field howitzer.

Proposed new musketry instructions for technical troops, Artillery and train.

Training regulations for the Italian infantry.

Foreign military intelligence.

Turkey. Changes affecting the promotion and employment of Staff officers.

France. 1907 Autumn manœuvres. The 1907 Budget.

The schools of St. Cyr and St. Maixent, are shortly to be amalgamated.

Italy. Improvement in the position of the Carabinieri reali.

The new Italian Field Artillery matériel 1906, compared with that of other powers.

Russia. Relations with Japan. New distribution of cavalry divisions round Warsaw. The command of machine guns in the infantry. The 1907 Budget. Transferring of officers to the Garrison Artillery. Reserve troops in the late war.

Naval news.

Technical intelligence.

An ammunition wagon and limber with a shield, patented by H. Zinck, in Austria.

Protection is afforded the detachment both when in action and on the march by means of a hinged steel shield which at the same time serves as combined seat, support footboard and back.

Intendence and medical matters.

Publication.

On the training of Field Artillery for war; by Maj.-Gen. v. Rüder. Published by Mittler, Berlin.

The book deals with—

1. The practical training of the teams in draught. And suggests—

2. A rational scheme of winter training.

3. Relieving the battery commander by doing away with practice reports.

4. Discusses tactics at practice camp, including battery leading.

5. The shooting itself with reference to battery formations with four-horse teams.

This book is highly commended.

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Reports, Precis, Translations, Etc.

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The Journal OF THE Royal Artillery.

CONTENTS.

"Memorial de Artillería." Translated by Major General J. C. Dalton, R.A. 189
The Battle of Kars, 29th September, 1855. By Brig.-General W. F. Williams 193
"Kein Schema." Translated from "Militär Wochenblatt." No. 36, March 16th, 1907, by Captain F. A. Buzzard, R.F.A. 198
"Revue Militaire des Armées Etrangères." Précis of contents. By Captain F. A. Buzzard, R.F.A. 201
"Revue Militaire Suisse." Précis of contents. By Lieut. R. K. McGillycuddy, R.F.A. 201
"Journal des Sciences Militaires." Précis of contents. By Lieut. C. O. C. Hunt, R.F.A. 202
Tactical Training in the Army. Translated from "La Nuova Antologia," by Lieut.-Colonel F. E. B. Loraine, late R.A. 207
Russian Quick Firing Field Artillery Equipment, Pattern 1902. Translated from the "Revue d'Artillerie," February—March, 1907, by Colonel A. H. C. Phillpotts, late R.H.A. 211
"Revue de l'Armée Belge. Précis of contents. By Lieut K. B. Ferguson, R.G.A. 213
Heavy Field Artillery in Germany. Translated from "Revue Militaire des Armées Etrangères," May, 1907, by Captain F. A. Buzzard, R.F.A. 214
"Militär Wochenblatt." Précis of contents 218
"Vierteljahrshefte für Truppenführung und Heereskunde." Vol. II., 1907. Précis of contents. 218

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Memorial de Artillería.

Translated by MAJOR GENERAL J. C. DALTON, R.A.

THE May number of the Spanish Artillery Journal is chiefly devoted to a long article by Colonel D. José Brull y Seoane of the Spanish Artillery, on the subject of Sporting guns *(Armas de Caza)*. This gentleman after devoting many years of study and experiments to this interesting subject claims to have solved it in a manner which one would think must revolutionize the whole matter of sporting rifles, guns, and ammunition.

After a brief introduction in which he comments on the many disadvantages pertaining to the present sporting guns, their ammunition and power, he proceeds to tell us what he claims to have done, viz:— "We now offer the practical means, without doing more than varying the barrels and cartridge, for increasing the effective range of the present guns, with shot up to 250 and 500 metres according to the calibre, and, in addition provide a simple apparatus for an independent line of sight, with an aiming corrector to enable both eyes to be used, a new powder, a special cartridge, and one general projectile which we call "grape shot" *(bala-metralla)*, for either large or small game, possessing undeniable advantages over those known."

He has also invented an original revolver-gun, which is to meet all cases or targets which a sportsman may encounter in any country. It will take ordinary cartridges equally well as the inventor's whether of ball or shot, which is a manifest advantage. The new powder can be used in all weapons which now use smokeless powder, and the "grape shot" can be used in the English *Paradox* guns.

This is an ambitious scheme; and the inventor next proceeds in detail to explain his methods, all of which he has patented.

I. *New system of barrels* for Sporting Guns of all calibres, called "Paratrex." Patent No. 40,617.

The object for which these new barrels are designed is to be able to employ with good result and greater efficiency three classes of cartridges, viz: for ordinary ammunition (small shot), leaden bullets of any form, and the new "grape shot" designed by the inventor. He calls his new invention *Paratrex*, on a par with the English gun known as the *Paradox*, which was only designed for the ordinary small shot and leaden spherical bullet.

Colonel Brull first started his new idea in the year 1900, when he ordered a 16 calibre gun to be manufactured by the Spanish firm of Victor Sarasqueta (Eibar), and with this weapon he made an extensive series of experiments which he shews graphically by "pattern" diagrams.

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He borrowed a "Paradox" from a friend and shows the results obtained with this gun at comparative trials. The diagrams which accompany the paper give the sections both longitudinal and vertical of the barrels of the "Paratrex" gun, and the letterpress explains fully the variation adopted by the inventor in the usual system of manufacture of sporting guns.

It would take a long time to translate the elaborate treatise by the author on his various inventions, and so far as the gun barrels are concerned I will merely quote his summing up:—

"The chief advantage of our gun barrels consist in its being possible without sensibly altering the weight of the weapon, or its recoil, to increase notably its effective range, and to employ every kind of projectile and powder without any danger. The barrels also resist perfectly any abnormal pressures which might occur through ignorance or carelessness in the loading of the 65 mm. (2″.55) cartridges, which are those most used."

The price of the *Paratrex* should not exceed that of the best English *Choke*, *Purdy*, and *Paradox*.

II. *New Smokeless Powder* for sporting rifles, guns, and revolvers of all kinds, called "A. XIII."

Colonel Brull informs us that during the years in which he has devoted his spare time to firearms he has been also engaged in considering the question of ballistics with a view to increase range. He had the honour of an audience with His Majesty Alfonso XIII. some four years ago on this subject which nerved him to the task of endeavouring to correct the defects in sporting guns which His Majesty had noticed in the most renowned foreign countries, and to produce a Spanish type of sporting weapon to surpass these.

The inventor then relates how with the assistance of his old friend and brother officer Colonel Don Ricardo de Aranaz, he obtain- a Royal decree for the production of a certain quantity of a new powder, suggested by himself, and worked out in the famous powder factory at Granada of which Colonel Aranaz is Director, and received the Royal permission to name the powder after the august Monarch to whom it is really due;—"A. XIII." on the occasion of obtaining the necessary patent. (No. 40,632).

Colonel Brull goes into the history of smokeless powders, starting with Major Schultze of the German Artillery who brought out, in 1882, the powder which bears his name, and he repeats their well known advantages and disadvantages over black powders. He gives in a footnote an interesting experience when quartered in the Phillippine Islands 30 years ago. He had to test some ancient black powders proceeding from the factory of Panguil, and which were in use some 50 years before. He found almost exactly the same results in the Eprouvette which were obtained at the date of manufacture.

After some space devoted to explaining the scientific aspect of the results he was searching for, he states that his efforts have been successful and claims for his smokeless powder "A. XIII." a long list of advantages over other modern powders, some of which are:—

(1). It gives a return, per grain of charge, 30% greater.

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(2). The manufacture is cheaper, and with care need not exceed one half.

(3). It leaves no residue, being the only powder which leaves the bore perfectly clean after firing.

(4). Left in an atmosphere saturated with humidity for 8 days, it absorbes no more than 2% against 5% in the case of other powders, which with 2% of moisture lose 50 metres in velocity, whilst "A. XIII." will only lose 25.

(5) For a difference in temperature of 20° "A. XIII." only suffers a variation of 10 metres in velocity, whilst with others they would vary more than 25 and at the same time the pressure would increase.

(6). Even if by mistake one employed the same weight of charge as in present patterns, the pressure will be somewhat less than those admitted with all weapons using smokeless powder.

(7). The chemical conditions are better.

(8). The physical characteristics which distinguish this powder from others are also superior.

(9). The comparison of the Spanish as against the English E.C. powder was tested in a 12 bore *Paradox* with 2½ grammes charge for the latter as against 1¾ for the former, and using a charge of No. 6 shot weighing 36 grammes, at 30 metres distance. The results are as follows:—

Powder	Recoil.	Laminæ penetrated.	Residue.
English	173	80	0·16
Spanish	143	91	0·00

On a circle of 2 feet diameter the pattern was

English.....125 Pellets.
Spanish .....157 „

The centre of impact was with the English powder 8 inches, and with the Spanish 6 inches from the point aimed at.

The experiments with E.C., A. XIII. and French T. powders firing ball are also given, and generally favour the Spanish powder.

(10). By simply increasing the thickness of the grain this powder can with advantage be used with sporting rifles and carbines, the charge being varied to suit the conditions.

(11). It is applicable to every class of revolver and pistol; also for primers and petards.

III. *New system of cartridges and projectiles* for all classes of weapons. Patent No. 40,669.

Diagrams are given of the cartridges proposed by the inventor. The ordinary shot cartridge is made of sheets of soft brass, iron, or steel. The cases are simple and cheaper than those now generally used, and the conditions governing the adoption of the pattern are stated.

Projectiles are made in 3 kinds, shot, grape shot, and solid, and illustrations are given of them.

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With the *bala metralla* (grape) the inventor has obtained uniformly an effective range of 100 metres (or 110 yards) with No. 7 shot with better effect than is obtained by other guns at 30 metres.

Briefly he sums up with some results of experiments with a 16 bore gun with 00 shot at 50 metres on a target 24 inches square.

MEAN OF 5 SHOTS.	IMPACTS ON TARGET.
With "grape" and brass case, 20 grammes of 00 shot and 29 pellets, bursting at 10 metres.	20
Ordinary cartridge, 00 shot, 30 grammes and 43 pellets, *(perdigones)*.	5

This result argues eloquently, Colonel Brull claims, for his system.

IV. *New aiming apparatus.* Independent line of sight and corrector for aiming, to use with both eyes and adaptable to all sporting weapons. Patent No. 40,670.

This is fully illustrated in the article, and described in the letterpress. It is a long steel sight bar attached to the centre line between the barrels, and with a sight vane, and two points of sight capable of lateral correction of $+1^{\circ}$. It is arranged so that either or both eyes may be used.

V. *New Repeating fire-arm, revolver type.* Patent No. 40,671.

There is a diagram showing the construction of this weapon, a 16 bore, but the inventor prefers a 10 bore in order to provide a general utility piece for sporting purposes, whether for small or large game or for pigeon shooting. Spare barrels and drums to suit different objects can be carried, and there are many advantages duly detailed, one being the perfect obduration that exists between the revolving chambers and the end of the barrel. There are 5 chambers, and different cartridges can be placed in them, and are easily got at and quickly changed when required. There are also sights corresponding to the various charges and many other like "jems."

After perusing the paper I have briefly alluded to, one cannot help admiring the ingenuity and assiduity of the inventor, and can only wish him the success he deserves for his ambitious project. At the same time one must feel that it is no light matter to attempt to revolutionize the conditions which have for so many years been accepted as regards sporting guns, cartridges, powder, shot, bullets, and sighting; and gun makers and the public generally will not be disposed to accept such drastic changes without ample trial and satisfactory proof of their superiority.

J. C. D.

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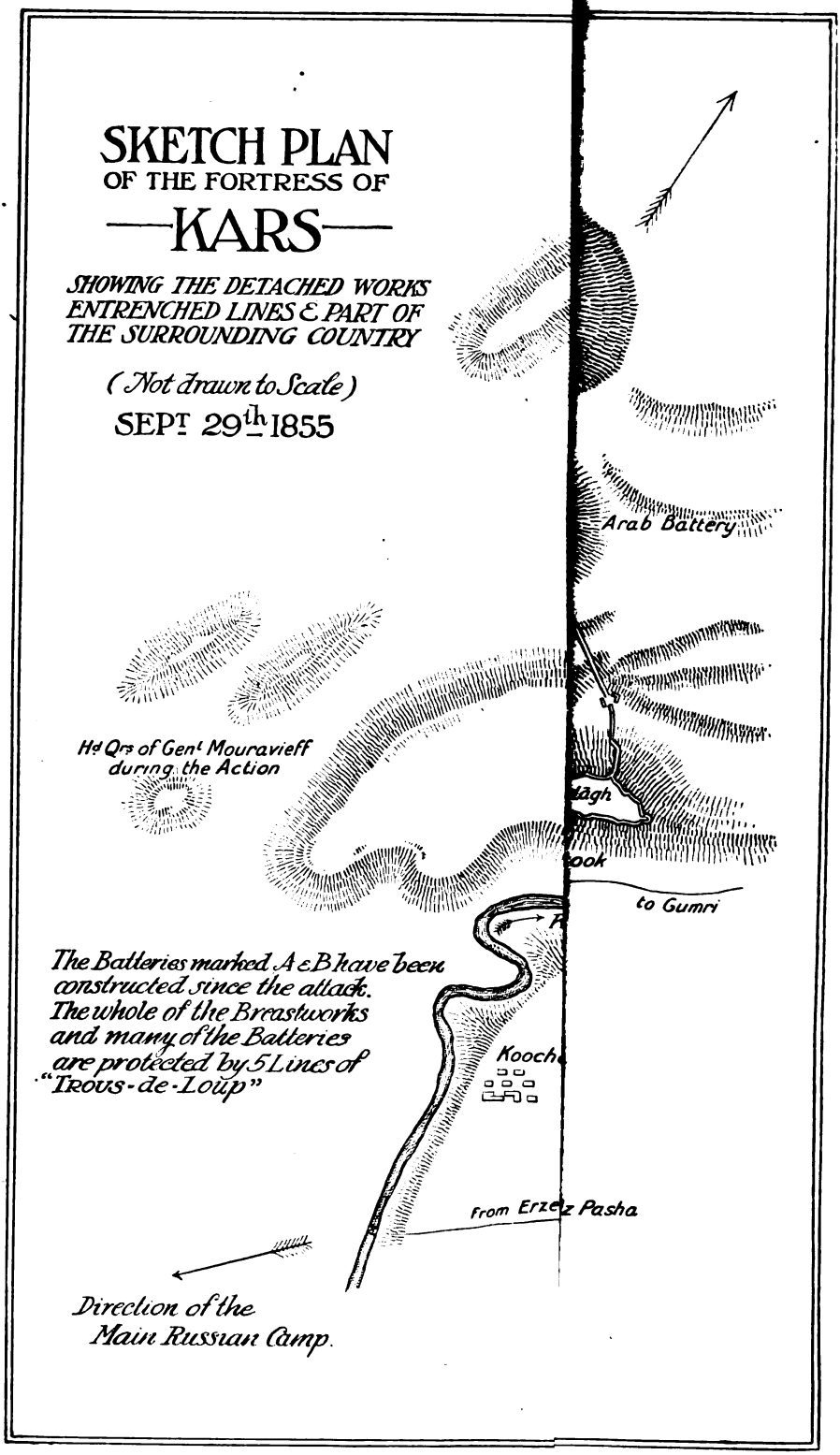

The original map referred to on pp. 1 slightly reduced.

The

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THE BATTLE OF KARS, 29TH. SEPTEMBER, 1855.

Description of the battle on the heights of Kars. (From an original rough draft of a report).

The sketches which should accompany the report are not with the documents received.

By Brig.-Genl. Williams, to the Earl of Clarendon.

1855.

Lord Clarendon, K.G., No. 157.

Kars. October 2nd, 1855.

My Lord,

I had the honor to announce to your Lordship on the evening of the 29th ultimo, the glorious victory gained on the morning of that day by the Sultan's troops on the heights above Kars over the Russian army commanded by General Muravioff, and I now beg to furnish your Lordship with the principal incidents of that sanguinary battle.

Your Lordship will perhaps recollect that in my dispatch* I stated that the Russian General, after his second demonstration against the Southern face intrenchments which is flanked by Hafiz Pash Tabia and Kanli Tabia, marched South and established his camp at Brouke Kechmé, a village situated about four miles off Kars, knowing that General Muravio served in the army which took Kars in 1828, I conceived his last manœuvre to be preparatory either to a reconnaissance or an attack upon the heights of Tackman from whence the Russians successfully pushed their approaches in the year above cited.

* No. 123, of 28th June.

Whilst, therefore, the enemy's columns were in march towards Banaz Kechmé I visited those heights with Lieut.-Col. Lake, and after studying the ground decided upon the nature of the works to be thrown up, these were planned and executed by Col. Lake with great skill and energy. I enclose for your Lordship's information a plan made by that officer of the town, and its neighbouring heights which are situated on the opposite side of the little river of the Karschai over which three temporary bridges had been thrown to enable us

* Your Lordship will observe that whilst our camp and magazine in the town were rendered as safe as circumstances would allow, the hills above Kars commanded all and

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were therefore the keys of our position.

to keep up our communications; as all verbal descriptions or birdseye views of ground convey but an imperfect idea of any locality, I beg to inclose a sketch made by Mr. Churchill which will I trust give you a better idea of what I am about to describe.

The intrenchments of Tackmas being those nearest the enemy's camp demanded the greatest vigilance from all entrusted in their defence, General Khemété a gallant Hungarian officer commanded the division which occupied this eminence, he was assisted by Major General Hussein Pasha, and my Aide de Camp, Major Teesdale, has acted as his Chief of the Staff.

Throughout the investment which has now lasted four months, the troops in all the redoubts and intrenchments kept a vigilant look out during the night and at their appointed stations stood to their arms long before day dawn.

In my despatch No. 155 of the 29th Sept., I informed your Lordship of the arrival of the news of the fall of Sebastopol, and of the landing of Omer Pasha at Battum; I also acquainted your Lordship with the fact that the Russian General was engaged in sending off immense trains of heavy baggage into Georgia, and shewing every indication of a speedy retreat. This in no wise threw us off our guard and Col. Lake was directed to strengthen many points in our extensive and under-manned lines*

* And amongst other works the Fabia bearing my name was constructed.

At four o'clock on the eventful morning of the 29th, the enemy's columns were reported to be advancing on the Tackmas front. They were three in number, supported by 24 guns, the first or right column being directed on Tackmas Fabia; the second on† Yuksee Fabia; and the third on the breastwork called Renmison Lines.*

† Ask Churchill.

* As soon as the first gun announced the approach of the enemy, the reserves were put under arms in a central position from which succour could be dispatched to Tackmas or the English lines

The mist and imperfect light of the dawning day induced the enemy to believe that he was about to surprise us, he advanced with his usual steadiness and intrepidity, but on getting within range he was saluted with a crashing fire of artillery from all points of the line; this unexpected reception, however, only drew forth loud hurrahs from the Russian infantry as it rushed up the hill on the redoubts and breastworks, these works poured forth a fire of musketry and rifles which told with fearful effect on the close columns of attack, more especially on the left one, which, being opposed by a battalion of 450 Chasseurs armed with Minnie rifles was, after long and desperate

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fighting, completely broken and sent headlong down the hill leaving 850 dead on the field, besides those carried off by their comrades.

The central attacking column precipitated itself on the redoubts of Tackmas and Yuksee Fabias where desperate fighting occurred and lasted for several hours. The enemy being repulsed in all his attempts to enter the closed redoubts which, mutually flanking each other with their artillery and musketry made terrible havoc in the ranks of the assailants, and it was here that General Khemeti and Hussein Pasha together with Major Teesdale so conspicuously displayed their courage and conduct. Lieut. General Kereem Pasha also repaired to the scene of desperate strife to encourage the troops, was wounded in the shoulder and had two horses killed under him.

The right column of the Russian infantry supported by a battery eventually turned the left bank of the intrenched wing of the Tackmas defences, and whilst the Russian battery opened on the rear of the closed redoubt at its salient angle, their infantry penetrated considerably behind our position.

Observing the commencement of this movement and anticipating its consequences, Lieut.-Col. Lake, who had taken the direction of affairs in the English Fabias was instructed to send a battalion from Fort Lake to the assistance of the defenders of Tackmas, and at the same time two battalions of the reserve were moved across the flying bridge and upon the rocky height of Laz Fabia, these three reinforcing columns met each other at that point, and being hidden from the enemy by the rocky nature of the ground confronted him at a most opportune moment, they deployed, opened their fire which stopped and soon drove back the enemy's reserves, which were then vigourously charged with the bayonet, at the same moment when General Khemeti and Major Teesdale issuing from their redoubts at Tackmas and charged the assailants; the whole of that portion of the enemy's infantry and artillery now broke and fled down the heights under a murderous fire of musketry. This occurred at half past eleven after a combat of seven hours.*

* In this part of the field the enemy had, including his reserves, 22 Battalions of infantry and a large force of Dragoons and Cossacks, together with 32 guns.

Whilst the struggle which I have attempted to describe was occurring at Tackmas, a most severe combat was going on at the Eastern portion of the line called the English batteries. About half past five oclock as a Russian column consisting of

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8 battalions of infantry, 3 regiments of cavalry, and 16 guns, advanced from the Valley of Chuckmack and assaulted, those small redoubts, which, after as stout a resistance as their unavoidably feeble garrisons could oppose, fell into their hands together with the connecting breastworks defended by townsmen and mountaineers from Lazistan, whose clannish flags, according to their custom were planted before them on the epaulments, and consequently fell into the hands of the enemy, who bringing 16 guns within the lines began to shell the town, but ere the firing had begun in this portion of the field, Captain Thompson had received orders to send a battalion of infantry from each of the heights of Karadagh and Arab Fabia, to reinforce the English lines. This reinforcement descended the deep gully through which flows the Kars river, crossed a bridge recently thrown across it by Colonel Lake and ascended the opposite precipitous bank by a zigzag path which led into the line of works named by the Turks the " English Fabias," their arrival was as opportune as that of the reserves directed towards Tackmas, which I have had the honor to describe in the former part of this dispatch. These battalions joined to those directed by Lieut.-Col. Lake gallantly attacked and drove the Russians out of the captured redoubts at the point of the bayonet, after the artillery of the enemy had been driven from those lines of the cross fire directed from fort Lake, and from Arab Fabia and Karadagh by Captain Thompson, this latter officer deserves my best thanks for having seized a favourable moment to remove a heavy gun from the Eastern to the Western extremity of Karadagh and with it inflict severe loss on the enemy.

Captured two of our light guns, which the mortality amongst our horses prevented our withdrawing from their advanced positions.

After the Russian infantry was driven from the English redoubts the whole of their attacking force of cavalry, artillery, and infantry retreated with precipitation, plied with round shot from all the batteries bearing on these columns. During their temporary success, however, the enemy also carried off his wounded and many of his dead. Yet he left 363 of the latter within and in front of those intrenchments; and his retreat occurred at least an hour before the assailants of Tackmas were put to flight.

During this combat which lasted nearly 7 hours the Turkish infantry as well as artillery fought with the most determined courage; and when it is recollected that they had worked on their in-

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trenchments and guarded them by night throughout a period extending to nearly 4 months, when it is borne in mind that they were ill clothed and received less than half a ration of bread, that they have remained without pay for 29 months I think your Lordship will admit that they have proved themselves worthy of the admiration of Europe and established an undoubted claim to be placed amongst the most distinguished of its troops.

With regard to the enemy, as long as there was a chance of success, he persevered with undaunted courage, and the Russian officers displayed the greatest gallantry. Their loss was immense. They left on the field more than 5,000 dead which it took the Turkish infantry 4 days to bury. As the garrison was afflicted with cholera and, I was apprehensive of a great increase of the malady, should this melancholy duty of the burial of the dead be not pushed forward with every possible vigour by our fatigued and jaded soldiers, I daily visited the scene of strife to encourage them in their almost endless task, and I can assure your Lordship that the whole battlefield presented a scene which is more easy to conceive than to describe being literally covered with the enemy's dead.

Their wounded and prisoners in our possession amounted to 160 whilst those who were carried off are said to be upwards of 7,000.

The Turkish dead and wounded were removed on the night of the battle. The dead numbered 361, the wounded 631. The townspeople who also fought with spirit lost 101 men.

His Excellency the Mushir has reported to his Government those officers who particularly distinguished themselves, a difficult task in an army which has shown such desperate valour throughout the unusual period of 7 hours of uninterrupted combat.

W. F. W.

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Militär-Wochenblatt.

March 16th, 1907. No. 36.

Translation by CAPTAIN F. A. BUZZARD, R.F.A., of an article entitled "Kein Schema."

"No Hard and Fast Rule!"

A contribution to the discussion: "Covered or in the Open."

By Captain Wagner, No. 7 Battery Royal Saxon Field Artillery, Regt. No. 77.

When reading the numerous contributions to military literature which deals with the modern methods of enploying Field Artillery, especially those written under the heading "Covered or in the Open," we find the attempt often made to treat the question as if it could be decided as a matter of principle. There is no more dangerous tendency than this, for it leads to that enemy of all tactical success, a hard and fast rule.

This question has become prominent mainly on account of the Russo-Japanese War and the introduction of shielded long recoil guns.

In my opinion it is unsound to arrive at definite conclusions as to how we are to use our Field Artillery, merely from studying the war just mentioned. Least of all can the experiences of that War be held to justify the claims put forward for covered Artillery positions situated far back from the crest of the protecting hill. Let us look into this question more closely.

The Russian Field Artillery received its new guns when it was leaving for the seat of war. The men had not been properly trained in the use of the new weapon, and the knowledge of its shooting powers was defective. The hurried manufacture and wholesale delivery of the ammunition, resulted in its acting badly. The Russian fire discipline was rough and ready, and the tactical employment of Field Artillery left much to be desired. The procedure of concentrating fire from a mass of guns on decisive points was not practised, and, last but not least, the teams of small horses obtained from Eastern Siberia, did not give the Field Artillery the necessary mobility.

On the Japanese side also the teams were worth little, so little indeed that, as on the side of the Russians, they made the employment of Field Artillery as we understand it extremely difficult, if not to a great extent impossible.

In some cases the Japanese guns could scarcely keep pace with the infantry, and therefore, when movements were in progress, could not bring fire to bear at the right moment from the right place. This fact had a great effect in prolonging the battles, and helped to give them their peculiar character, which can best be compared to the digging operations of moles.

I shall not here discuss other factors which tended towards slowness in the conduct of engagements, but merely suggest that, owing to the strategical principles recognised by us, and the better use to which we put the mobility of the largest strategical units, as taught more especially by Count v. Schlieffen, in his examples, the conduct both of the whole campaign and of the battles would have been different with us.

The Russians, who underwent such painful experiences on the Yalu with their Field Artillery, mainly owing to its tactical misuse, became too careful, or rather too timorous, in the subsequent battles, and let their Field Artillery fight in positions far behind the covering crests. The Japanese allowed themselves to be led astray, or were compelled by the lack of mobility in their Field Artillery to follow suit. The result was that both sides surrendered the initiative as regards offensive or decisive action on the part of the Field Artillery. If the latter was employed in more advanced positions, it was only on occasions when it could be deeply dug in. Batteries so entrenched could not, however, be harmed by shrapnel fire, but only by common shell, and even then they were strictly speaking, suitable objectives for the heavy guns of the Field Army, for, as we well know, decisive results are not to be expected against such targets with the common shell we (the Field Artillery) carry.

It is only in this way that the poor results obtained by Field Artillery in the Russo-Japanese war, results which fell short of all expectation, can be explained. Only thus can we account for the

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examples furnished by Major Löffler, in his work "Der Japanisch-Russische Krieg," Vol. II., page 117, last paragraph). The explanations offered later on, on page 118, are to my mind insufficient, for a gun remains steady, whilst a rifle is held by a man. All the laying is under the control of the No. 1, as is also the setting of every fuze. The service of a gun in the Field Artillery is therefore much more to be relied upon than is the use of a rifle by an infantryman, who is thrown entirely upon his own resources, even under the distracting influences of a battlefield.

When infantry as described by Major Löffler, advances or retires over hill tops in dense masses—broad and deep—and is on one occasion "under the hottest shrapnel fire," and on another "enveloped in shrapnel," it must suffer annihilating losses in a short time. If not, the Artillery commanders concerned must have observed badly and conducted the fire incorrectly, or else the guns were in complete covered positions several hundred metres behind the crest and indirect laying was employed, a mode of action which is bound to end in failure when used against moving targets on service. Perhaps both causes came into play.

Major Löffler, further states that Artillery held its own for hours against guns several times as numerous as its own at ranges of 2,000 to 3,000 metres—without shields, let the reader note. Unless the fire control or fire discipline was at fault on the enemy's side, this can only have been possible under the conditions mentioned above. Either the weaker Artillery was placed a long way behind the crests of hills, and thereby suffered slight losses only, whilst being itself of course unable to produce more than slight effect —even this should have been denied to it if it was outnumbered to the extent stated—or it was so strongly entrenched that it could only be injured by common shell, and that but slightly.

Are we, owing to the Artillery experiences of both Russians and Japanese in the late war, to place our Artillery as a matter of principle hundreds of yards behind the crests of hills, where it will certainly suffer but small losses, but where it will be unable to gain rapid or decisive results; where it will be a matter of impossibility to engage moving targets quickly enough, and finally where the occupation of the position will necessitate such special appartus and such an expenditure of time as can only be practicable in war under certain particular conditions?

I shall only briefly indicate the difficulties which attend the control of fire even in the case of a single regiment when such positions are adopted.

Here again we must not be led away by the experiences of the Russo-Japanese war. We have doubled the proportion of Artillery in the units of our army, and shall never fight on the exaggerated fronts which were taken up during the late war, and the adoption of which would not have been possible, unpunished except in the case of two such opposing armies as those of Japan and Russia.

Our Field Artillery must fight in very limited space, a condition which renders the adoption of fully covered positions far behind the crest, and the control of fire from such positions, difficult.

As a rule, when such positions are taken up, the battery commanders and the brigade and regimental staffs, with their Adjutants, orderlies, flag signallers and telephone operators, must place themselves so far in front of the batteries that they can see their targets.

Either they must go forward and remain exposed to the enemy's fire, which will first be directed at the crest and then onto the reverse slope, and soon fall victims to it or they must dig themselves in. In order to do this, however, they must go onto the top of the hill. "Digging in" takes time. It can only be successfully carried out by night, for by day it would give away the position and allow the enemy to occupy himself very agreeably in firing upon the various Staffs, which would be nine in number in the case of a regiment.

Hence it follows that a covered position of this kind will hardly ever be possible to occupy except under the cover of darkness.

I have only briefly touched upon a point which receives far too little attention in peace time, and which is unfortunately almost entirely neglected at practice, where the enemy does not return one's fire.

Speaking generally, I am of opinion that we, by adopting the practice of fighting in these positions when not compelled to do so by very exceptional circumstances, convert ourselves into Foot Artillery, without possessing its weight of metal. We more or less fall between two stools.

Neither the Japanese nor Russian Field Artillery had shields.

Shall we, who now obtain increased cover owing to our being provided with shields, regard the question of cover as the most important consideration in the choice of a position? Never!

The very fact that shields make it possible to remain a long time under hostile fire without being crushed, the fact that a shielded battery cannot be put out of action by time shrapnel fire without an undue expenditure of time, if at all, these are to my mind a proof that we should now doubly underline the maxim: "first effect; then cover."

The great tenacity of life possessed by shielded batteries has done away with the idea, which to my mind was not sound even formerly, that the Artillery duel must be fought out before it is attempted to decide the infantry combat. The infantry will push on to force a decision, regardless of the fact that its Artillery may still be engaged with the hostile guns, but nevertheless grateful for any Artillery support to their attack.

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This tenacity of life afforded by the shields has simplified our views as to the tactical employment of Field Artillery, and in many cases altered them.

I may perhaps be permitted to devote a few words to this question. The principal task of Field Artillery is the preparation of the decisive infantry attack and the support of the infantry in that attack.

This task will be best and most simply performed by firing on the objective of the attack, i.e. the enemy's infantry.

The hostile Field Artillery can impede us in the carrying out of this, our most important duty in two ways. Either it can bring such a fire to bear upon us (i.e. the Artillery) that we are obliged to return it in self defence. By thus engaging the hostile guns we are only indirectly progressing towards the fulfilment of our chief mission, that of firing on the enemy's infantry; but the evil is necessary. Or the hostile Artillery can interfere with our firing on its infantry by bringing such a fire to bear upon our infantry that the latter can make no headway. In this case we must first render the opposing guns harmless, at least to the extent of forcing them to turn their attention from the infantry.

Here, then, engaging the enemy's Artillery is again a necessary evil. In either case we shall gain an advantage if we can arrange to occupy the attention of the enemy's guns with only part of our Artillery, and turn the rest of our guns on to the opposing infantry. It is especially to this portion of our Artillery, engaged with the opposing infantry, that the infantry rule of "pushing on" applies up to a certain point.

The nearer the crisis of the battle approaches, the more regardless of consequences to itself should the Field Artillery be in its effects to crush the enemy. This means that it must push on to decisive Artillery ranges, knowing that it can thus produce more rapid and decisive effect than by remaining in fully covered positions. The fact of one battery or another being knocked out does not signify, provided that the investment pays, and the battery which sacrifices itself has inflicted losses twice or three times as important upon the enemy before it succumbs.

They do not ask in the Infantry, when the issue of a battle is at stake, whether some portions of their strength are going to be wiped out, as long as the whole is successful, and Field Artillery has no special claim to immortality (literally: "is not lite insurance").

When we come to look into these questions more closely we see that we must give up the old set rule that the whole of our Field Artillery must be brought into action at the first shot from the enemy. Not only the commander of the whole force , but also the Artillery commander, must be allowed to hold back portions of the Artillery at the commencement of an engagement and so place them that they can suddenly bring fire to bear upon the enemy in directions unexpected by him and unfavourable to him. It must also be the rule for Field Artillery only to employ such a proportion of its strength, at the beginning of a battle, as appears sufficient to deal with the immediate objective.

In any case the most important maxim for Field Artillery is still: "rapid and decisive effect combined with the best possible use of cover."

It is impossible to lay down definite rules for carrying out the precepts of this maxim. The employment of Field Artillery, depending as it does, not only upon the tactical situation, but upon ground, weather, light and a number of other accessory circumstances, will be subject to many variations.

I shall here give a few examples only of the various ways in which Field Artillery may be used.

It may sometimes happen that we shall have to bring all our guns into action in covered positions far back from the protecting crests, when engaging hostile Artillery. In the majority of cases we shall probably place our guns close in rear of the crest so that they are completely concealed from the view of the enemy, but can at the same time be laid direct on opposing Artillery or infantry by means of elevated dial sights, trusting to our shields for cover from fire. We shall also, when necessary, so place the guns that direct laying over fore and hind sights can be used, especially when we have to engage targets at close ranges or in rapid motion. We shall on occasions employ great lines of guns, but we shall only employ a portion of the Field Artillery to commence with, keeping the remainder in reserve so that it can enter into the fight later, in forward and flanking positions, and unexpectedly engage the enemy's guns or infantry. We may sometimes, however, find it best to let part of our Field Artillery fire from fully covered positions " retired " from the crest, and at the same time send other batteries forward. We must also count upon being sometimes obliged to temporarily, withdraw part of our Artillery from the fight, in cases where all the guns have become engaged, in order to send it forward. We may perhaps send batteries on to accompany the infantry attack as is done in the case of machine gun sections. When the field of view is restricted by thick mists (as was frequently the case during the last manœuvres) we shall attach batteries and brigades to the different regiments and brigades of infantry in order that they may act in the closest union with the latter in bringing fire to bear on the same targets as are being engaged by them.

In short, it is my opinion that the method of employing Field Artillery will differ for every battle, and that we need not therefore attempt to lay down rules as to what particular form of position is to be preferred. Our Field Artillery must be so trained in peace, that in war it will be capable of dealing with all these situations.

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The main point is that our Artillery leaders should be thoroughly versed in infantry tactics, and that they should know how to employ Field Artillery, in accordance with the situation and with the plans of the general, so as to support its infantry and produce effect as rapidly as possible. Moreover the most important point for all ranks of the Field Artillery is that their practice training should be good. In this connection the allotment of the necessary annual supply of ammunition and of the requisite number of practice grounds is becoming more and more difficult to obtain.

It is also most necessary that we should keep ourselves thoroughly conversant with the methods of conducting fire, and with the technical details of our guns and ammunition.

Finally the best advice for all Field Artillerymen is "No set rules, but use your initiative."

Revue Militaire des Armées Étrangères.

PRECIS OF CONTENTS.

Translated by CAPTAIN F. A. BUZZARD, R.F.A.

March, 1907.

1. The German Imperial manœuvres of 1906. (To be continued).

2. The Administrative Staff of the British army.

3. The Siege of Port Arthur (continued). Part II. Chapter 3.

The present instalment of this very interesting account deals with the Nan-Shan position in detail, numerous sketches and a map (scale 1/12,500) illustrating the natures of the works constructed and the method of their distribution.

4. Foreign military notes.

April, 1907.

1. The German Imperial Manœuvres of 1906. III. Observations.

As regards the Artillery, positions appear to have been more carefully concealed than in the manœuvres of the previous year, but the number of guns could generally be counted by the flashes. On the near approach of hostile infantry the guns were generally run up to the crest by hand. Positions to receive them there were, when time permitted, prepared beforehand. Guns and detachments were as a rule protected by entrenchments.

2. Military Automobiles in Italy.

3. The Siege of Port Arthur (continued). Part II. Chapter V. The battle of Nanchan.

Good maps again accompany this very interesting account, which is to be continued.

4. Foreign Military Notes.

England. An account of the manœuvres of 1906, ends with some particularly eulogistic paragraphs with reference to the state of instruction, keenness and scientific equipment of the troops.

Revue Militaire Suisse.

By LIEUTENANT R. K. McGILLYCUDDY, R.F.A.

No. 12, December, 1906.

1. Manœuvres of the 4th Army Corps. An article written by Genl. Langlois of the French army.

2. Reorganisation of the umpire staff.

3. The attack on Langres.

4. Small notices.

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"Journal des Sciences Militaires."

PRECIS OF CONTENTS.

By LIEUTENANT C. O. C. HUNT, R.F.A.

February, 1907.

From Mukden to Nancy. A criticism of the Russo-Japanese war. By Major E. Ferry.

The Centenary of the battle of Eylau. The parts played by Ney, and the Prussian corps in the battle. Extravagant praise and harsh criticisms. An impartial examination. The answer of facts. By Lieut.-Col. Picard.

Thoughts on the medical service on the eve of battle.

The ambulance.

The field hospital. By Dr. Berthier, Principal Surgeon in the army.

The tactical value of fortresses and fortified areas.

Chapter III. Fortified areas.

Chapter IV. Fortified areas in France.

Chapter. V. The effectives of a corps in observation of a fortress or fortified area. (Conclusions). By Capt. X. *psc.*

The war of the Austrian succession, (1740-1748). Part II.

Operations on the Main (1st part of 1743 campaign).

1. The march of the Pragmatic league and deNoailles armies towards the Main.

2. The detachment of French troops in Bavaria. The march of deNoailles army to the lower Main.

3. March of the Pragmatic army to Aschaffenburg. (To be contiued). By Major Z.

Questions of Artillery tactics, in the light of experiences in the Russo-Japanese war.

Experiences during the war has shown the great necessity of covered positions for Artillery. Artillery must positively be concealed from view. The faulty conditions obtained at practice camps have led to misapprehensions as to the choice and reconnaissance of positions: moreover the additional difficulty of directing fire from behind cover, added to increased risks have led, among all European amies, to a want of appreciation of the value and necessity of fire from behind cover; an increased use of these positions is called for.

Nor can arguments adduced against this view be sustained on examination of the facts; though many examples can be cited to bear it out.

Artillery in position, not only in the open, but even partially or mostly concealed has sustained very severe losses under hostile effective and concentrated fire; being put completely out of action or silenced, and unable to resume fire until other batteries have rescued it from its evil case, or until it has been enabled to change its position for one more sheltered from the enemy's view.

The lesson of the war goes to prove that when engaged with a strong enemy armed with the latest pattern Q.F. guns, Artillery must be placed in covered positions; only very exceptionally in the open: this former includes shelter in rear of a crest, the slopes of a ravine, behind a village &c., trees or cultivation available as a screen. The exceptional cases when Artillery may be placed in the open are:—

1. When there is a total lack of covered positions or if these latter do not satisfy the tactical and technical requirements.

2. When the enemy is devoid of Artillery or it is so weak as to be quite inefficacious.

3. In cases of emergency when a position already decided upon must be occupied, or assistance afforded to other troops.

4. Occupying positions when in pursuit.

If Artillery is to remain for any time in the open, the position must be concealed from view by artificial means 330 yards —440 yards in front. i.e. by screens made from materials found on the spot.

Covered positions may be divided into 3 categories:—

1. Those near the crest, concealed from the enemy's view.

2. Those 440 yards from this crest.

3. Those hidden from view by roads, houses, trees, cultivated fields, &c., &c.

1 can again be sub-divided into those where—

(i). 6′ below the crest men on foot;

(ii). 9′ below the crest men mounted;

(iii). 14′—15′ below the crest the flashes from the guns;—are respectively concealed from view.

These coming under the first category hardly differ from positions in the open.

Experience in the late war has proved that directly fire is opened the position is betrayed to the enemy by the flashes; and

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even when the position is such that the flashes are not visible, the dust which is raised or the bursting of premature shells can be seen.

To find the distance in rear of the crest from which the flashes will be invisible; determine the distances from which a mounted and dismounted man are concealed from view over the crest; then twice the distance of these two apart will give the distance in rear of the former from which the flashes are concealed. Another way is to find the point at which the eyes of a mounted man are at the same level as the feet of a man on foot who is himself just concealed by the crest line; this is equal to about 15 feet below the crest.

A position immediately in rear of the crest does not protect Artillery from fire: peace training has tended too much to encourage a belief to the contrary.

With the methods of fire employed by both the French and Japanese Artillery—i.e. by firing at different elevations, so as to sow with shrapnel all ground beyond the lower end of the bracket beginning from this latter—it is obvious that batteries placed within a distance of 300 yards —450 yards of the covering crest will sustain just as much damage as when in the open; the enemy noticing the flashes or dust raised behind the crest, will range on this latter and then go to searching fire. But when the position is more to the rear, the hostile Artillery will have a considerably more difficult task and one involving a great expenditure of ammunition with a problematical result..

The Russians found great difficulty in arranging for their observing stations and the means of communicating the results of the observations to the batteries.

Signalling seems to have been deficient, and little used; telephones were usually the means employed, but in many cases the wires were cut by shells, and then flags were had recourse to; the morse code was used, two flags representing a dash, one a dot.

The choice of positions behind cover, it is to be remembered, depends upon the configuration of the ground, the tactical considerations and the missions assigned to the Artillery. The greatest field of fire possible of course must be ensured; in order to do away with dead ground, infantry fire must be combined with that of the guns; this latter, of great importance, is only possible when the position is well in rear of the crest and is a cogent reason why the reconnaissance and choice of Artillery positions should always be carried out with the co-operation of the O.C. the section of the line.

A little instrument to test whether the trajectory will clear the crest is described by the author, in form and principle somewhat like the sights of a rifle.

All Artillery positions even those behind cover must be entrenched and sheltered; should the distance of the position in rear of the crest become known to the enemy, or in other possible circumstances, the battery will come under effective fire. Trenches afford the best protection against both intermittent and salvo fire. Should the enemy keep up a continuous effective fire so as to utterly forbid the service of guns ; the best way is to change position, even a few yards to right or left front or rear, may sometimes suffice. In the case of previously prepared positions, there must be two, to guard against the exact positions becoming known to the enemy through spies.

To reduce the amount of "dead" ground in front of an Artillery position behind cover it is suggested that infantry should be so placed as to bring this ground under rifle fire: machine guns, also mountain guns can be most efficiently employed in this way also; or even in cases of absolute necessity sections of field guns as instanced in the late war. Emplacements for these latter are then imperative.

These guns are kept concealed till further orders behind the crest and maintained in a waiting position.

In choosing Artillery positions, the reconnoitring sections must also have positions prepared for them; their rôle is to draw on the enemy and induce him to disclose his positions by opening fire; being incapable of delivering a powerful fire themselves, they should be ready to rapidly change position should they be dangerously threatened by the enemy.

Hence mountain guns can be most advantageously employed.

Should natural cover be non-existent, screens must be improvised; the best materials for this purpose are sheaves, bundles of brushwood &c., piled in heaps in front of the batteries as far to the front as possible so that the battery thus hidden is outside the beaten zone, when the enemy conforming to rule passes to effective fire.

Of course the enemy may keep increasing the range fired at, but this means an enormous expenditure of ammunition with no result especially if the battery fired at moves position to right or left.

Positions in echelon were found to answer admirably; the flank batteries being refused; distances and intervals between batteries being double the frontage of a battery; in this way front can be changed through 120°. The necessity of changing the original front of batteries led to an abandonment of the aligning all batteries of a brigade on the same front: it was found to be unsound and with the advent of telephones and signals to be of no benefit. Batteries were likewise also greatly extended.

The observing station should be connected by telephone with the Artillery Commander and with batteries.

It is generally very difficult for a brigade commander to select a good position from which to observe, now that Artillery takes up for choice, a position well in rear of the covering crest, especially in

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level country. Sometimes artificial posts of observation were erected, such as a tripod formed of poles, to which was fastened a rope ladder secured to the ground at its lower end. Trees to a flank, or in rear of batteries, proved admirable observing posts; timber, hammer, nails and ropes should be carried with batteries to make the trees accessible.

Observers are well hidden and are rarely if ever made a target of by the enemy.

Communication between the different arms proved sadly lacking, this is most important and was fully appreciated and arranged for by the Japanese. On capturing a certain village, the Russians found a telephone station with wires to each unit, redoubt and trench. The Japanese made a speciality of this; besides the telephone they used many other means such as rockets, beacons, Bengal lights, &c. &c.

Serious attention must be paid to intercommunication between units, and a system devised whereby information and orders bearing on the fight may be transmitted as rapidly as possible: such for instance as when a village is captured and fire is no longer to be directed on to it; the Japanese made use of flags for this purpose, and this is well worthy of imitation, for colours inspire the troops with courage and confidence in victory.

Publications.

The war of 1870-71. The army of Châlons.

1. Organisation and plans of operations. The march on Montmédy.

II. Nouart-Beaumont. Published by the historical section of the French general staff. Paris: R. Chapelot & Co.

From Port Arthur to Tsu-Shima. Lessons from the last naval war. By Count M. des Courtis. Paris: Perrin & Co.

March, 1907.

Studies on tactics (continued).

The decisive engagement. Preparation of and carrying out the decisive attack. (To be continued). Lt.-Col. Dencausse.

Looking back.

Studies in military history of the XVIII. century. A retrospect of men and matters. By Leon Hennet. (To be continued).

The training of cadres in the infantry. By Lieut. Balédent.

The Russian infantry in winter quarters. Their religion, education, various exercises and training, amusements.

Field Artillery with Q.F. guns.

The present state of the question.

Part II. Matériel.

Belgium. As the result of practical tests has adopted the Krupp equipment.

Brazil. Has adopted the 75 mm. (3") Krupp shielded gun, firing a 15½ pr. shell.

Bulgaria. The Schneider-Canet gun.

Chili. Krupp equipment.

China. Various makes.

Denmark. Krupp; calibre, 3"; long recoil.

Spain. Schneider.

U.S.A. After many experiments at Sandy Hook conducted by a commission of experts, an order was placed with a Bethlehem firm to supply equipments on the Ehrhardt principle; their construction is now being carried out on Rock Island.

The gun is of nickle-steel with a jacket prolonged to the rear to contain the breech mechanism; which latter consists of a breech screw with interrupted threads; a single horizontal movement of the lever is sufficient to open or close the breech.

The gun is mounted on a cradle, which contains the recoil checking mechanism: the cradle itself is carried on a cradle carrier by means of a vertical pivot to the front and may be traversed; the latter may be elevated or depressed about the axle. Total weight, 11 cwt. 6 lb.

The mechanism checking recoil consists of a cylinder and piston, the latter remains stationary; together with 3 running up springs, there is also a control arrangement preventing a too sudden return action.

The sight is an independent one.

The trail is of steel.

The layer is responsible for direction only, the firing number for elevation.

The shield, composed of 3 parts, is ·197" thick; the lower part can be raised, the upper portion folded down, the middle one is fixed.

Recoil and return takes 2 to 3 secs.: 10 to 12 rounds per minute are possible.

Three kinds of ammunition, common, high explosive, and shrapnel shell, are carried; weight, 15 lb. with an initial velocity of 1700 fs.

The limber is entirely of metal with the exception of pole and wheels. It seats 3 and contains 39 rounds, weight filled just over 14 cwt. The wagon limber is similar but carries 70 rounds, likewise the wagon body; hooks are fitted to the rear of each body so that several may be hooked up together, should motor traction be available; weight filled, 1 ton 4 cwt.

The battery consists of 4 guns and 12 wagons; ammunition carried 1,432 rounds, 358 per gun.

The equipment would seem to be a good one.

France. The 1897, 75 mm. gun.

The gun is supported on 3 fixed points; the spade on the trail, and two on the shoes placed under the wheels when in action: the carriage is unmoved after the first round.

Traversing is effected by a screw engaging with threads on the axletree, over which the cradle slides. Sighting is by means of a collimator mounted on a standard, round which it revolves; this is set at the angle due to wind, displacement &c.: the line of sight is independent; the angle of sight is given to the cradle carrying the gun and is measured on a dial; the angle of elevation due to range is given with respect to the cradle. Recoil is checked by means of a hydro-pneumatic brake, the piston of which is fixed to the breech of the gun; running up springs are also provided.

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An ejector has been fitted.

Ammunition is of two kinds and is fixed; the charge is powder "B" smokeless.

Both projectiles have double action fuzes (P. & T.); the height of burst is regulated by means of the fuze setter and corrector.

The shell with rear charge is of steel and is divided into 2 chambers; the lower contains the bursting change of 3 oz: on bursting, the head flies off, and the shell acts as a gun barrel; the bullets are given an additional velocity of 230-330 fs.

Besides this there are three kinds of "Robin" shell; the '97 pattern contains 240 bullets of antimony lead, nearly ½ oz. with 17·41 oz. of compressed powder: it is incendiary.

Another pattern is filled with bullets made of a mixture of lead-antimony and tin, and the bursting charge is weaker: the 3rd pattern has thinner walls and 30 more bullets; these are used against personnel: against matériel a lengthened shell is used.

The wagons are upended in action and are armoured; they carry 72 shell and various stores.

Compared with the German gun:—

French. Initial velocity, 1738; weight, 15·95 lb.

German. Initial velocity, 1640; weight, 14·3 lb.

The breech mechanism of the German gun would seem rather slower than the French hence a slower rate of fire would ensue.

The line of sight is not quite independent in the German gun.

The French army has 1,984 guns, the Germans 3,102; (not including German Hotchkiss of Q.F. French guns) giving the Germans a superiority of 1,118; nevertheless the French guns carry more ammunition, 312 rounds per gun to the formers 188.

The number per army corps is 28,704, to the Germans 27,158, an inferiority of 1,546.

The *Rimailho* 155 mm. (5·91 in.) howitzer.

The war in the Far East has proved that guns of large calibre for use in the field are imperatively requisite; to meet this requirement the 155 mm. has been introduced and tried with some success at the siege of Langres, last year. It fires a shell of 45 lb.; to facilitate its transport in the field the gun is separable from its carriage; the former being carried on a kind of trolly; on coming into action the gun is slid on to a platform; the operation only takes 4 minutes. Varying charges are used. There is no recoil, the mechanism checking this is secret. The cartridge is enclosed in a copper cylinder. There are 6 numbers at the gun, 4 at the wagon.

At Langres, these Rimailho howitzers fired 80-100 shells at a mean rapidity of 3 rounds per minute per gun.

3 carriages, 1 8-horse, 2 6-horse, per gun are required, or 80 horses for a battery of 4 guns or about 100 including riding horses, &c.

New Horse Artillery gun.

Trial is being made of new 75 mm. (3″) gun of a total weight of only 29¼ cwt.

Meanwhile the old 80 mm. is retained, the 75 owing to its spades digging into the soil has been considered unsuitable for Horse Artillery.

Experiments are also being made with a new mountain equipment.

Greece. Trials are still proceeding.

Holland. A 75 mm. (3″) nickle steel recoil action Krupp gun has been adopted with 4 mm. (·157 in.) shield in two portions, and a very simple breech action.

Ammunition is of two natures; shrapnel containing 270 bullets of 11 grams (·38 oz.) and common shell both of 16·9 lb. with T. and P. fuzes.

Initial velocity 1640 fs.

Delivery is to be completed by 1906.

Endeavours are being made to design a howitzer of moderate calibre for use with Heavy Artillery.

Italy. Italy is altering her 9 cm. (3·543 in.) into Q.F's.

3 kinds of ammunition are used:—

1. Shrapnel, 176 bullets of 0·46 oz.
2. Segment shell.
3. Case, filled with 223 bullets of 0·81 oz.

The chief alteration is in the carriage; having finished 120 batteries, operations have been suspended.

A certain number of batteries were issued with new 75 mm. (3″) steel guns in 1902 which have yielded good results.

The breech mechanism consists of a breech screw closing with 2 movements; with an axial vent. The carriage is a rigid one, carrying however, a cradle on which the gun is mounted and pivotted about a vertical axis. The trail is provided with a spade and brake to check recoil. There are no shields.

The gun fires—

1. Shrapnel, 14·75 lb. in weight, P. & T. fuze set mechanically, and contains 180 bullets ·354 oz. and 140 of ·389 oz.
2. Case, containing 37 hexagonal prisms.
3. Explosive shell.

The cartridge case is made of brass.

The equipment is one allowing an accelerated rate of fire, and much resembles the German equipment and is a combination of Italian and Krupp's designs; rapid fire is considered to be of very rare occurence and unnecessary to provide for.

Trials have not proved eminently satisfactory, however, (weight too great, slowness of fire, and inaccuracy) and other designs are under consideration; negociations have been completed with Krupp, for the right of manufacture of an improved pattern, by the Italian Government; Krupp to construct certain portions.

Weight of gun 6¼ cwt.
Weight of gun and carriage, 19 cwt.
Weight of limber with 32 rounds 15½ cwt.
Weight of projectile 14·4 lb.
Weight of charge (cordite) 16·6 oz.

At the same time the rigid carriage of the 75 cm. are to be transformed.

Japan. The Arisaka gun, dates from

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1898, was designed by a Japanese officer, the successful candidate in a competition arranged by the Japanese Government.

The calibre is 75 mm. (3 inches); it has to be relayed after each round and is merely a gun of accelerated fire; constructed of steel the trunnions serve as axletree; recoil is checked by drag shoes provided with spades connected to running up springs; in addition there is a wheel brake: no shields.

The shrapnel contains 234 bullets; weight, ·378 oz. fuzed with T. and P.

Common shell is filled with 28½ oz. of explosive. The charge is made up in metal cases. Each limber carries 40 rounds. 4 to 5 rounds per minute is the normal rate of fire, though 10 per minute could be attained under favourable circumstances. The gun much resembles the 1896 German equipment.

The mountain equipment is analogous in principle to the foregoing, and fires the same ammunition; but the gun is shorter, 39·37 inches instead of 86·3 inches.

The 12 cm. (4.71 inches) field howitzer manufactured by Krupp, is non recoiling but no details are yet forthcoming; 24 of these howitzers took part in the battle of the Yalu.

Russian and Japanese guns compared.

Russian. Weight of shell, 14·3 lb.; initial velocity 1931 f.s.; weight of gun, 37 cwt.; shrapnel, 260 bullets of ·377 oz. and 234 of ·3781 oz.

Japanese. Weight of shell, 13·41 lb.; initial velocity, 1501 f.s.; weight of gun, 32·36 cwt.

There is no question as to the superior merits of the former though full use was not made of the advantages conferred. The Japanese Artillery was more mobile and above all the ammunition was of the best quality. The efficacy of shrapnel at the beginning of the war was overwhelming because neither side knew how to protect themselves; but when indirect fire came into vogue, engagements only took place at long distances and the effects were practically nil. The Japanese who alone had common shell only obtained good results against places and troops with shrapnel especially at long ranges.

Although the guns were not Q.F's., the expenditure of ammunition exceeded all expectations; and the number of wagons proved ridiculously insufficient; 3 wagons per gun are now contemplated. (To be continued).

The war of the Austrian succession (1740-1748).

II. Operations on the Main (1st part of 1743 campaign). The battle of Dettingen. (To be continued). Major Z.

Military notes of the month.

Soldiers' libraries—The position of the N.C.O's. The Staff College changes.

Publications. Of no special interest.

April, 1907.

Sinicæ Res.

The awakening of Asia and imperialistic ideas. By General Chanoine.

Studies on tactics.

The action of troops ordered to follow up a success or minimise a reverse.

Attack on positions. Occupation of positions. Moral in war. (Conclusion). By Lieut.-Col. Dencausse, 4th Zouaves.

Questions of Field Artillery tactics, illustrated with examples from the Russo-Japanese war. Translated from an account by Col. Biélaïeff. Z

(This article contains little of any interest, being descriptions of certain incidents in a number of small engagements; there is little fresh to be learnt from it).

The modern organisation of the Staff of an Army Corps. By Capt. Clerc, *psc.*, (French).

The soldiers of the revolution.

Study of practical military sociology.

Chapter III. Patriotism and humanitarianism. (To be continued). By J.D.

The duty of the officer in matters of hygiene.

Hygiene is not purely a medical care. Watching over the mens' health. Enquiry into the causes of sickness. Preventitive measures. Exercise; effect of cold; heating; personal cleanliness. (Conclusions. Dr. Viguier.

Military notes of the month.

Proposal to transform 40 Horse Artillery batteries into 60 field batteries. Cavalry division batteries to remain as at present still undecided.

Publications.

Napoleonic wars.

Part I. Precis of campaigns.

II. System of operations.

III. The battles.

By Lt.-Col. Camon, Assistant Comdt. of the Ecole Polytechnique. Published by R. Chapelot & Co., Paris.

The Hague conferences. Arbitration—Disarmament. By Gen. Pedoya.

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La Nuova Antologia.

TACTICAL TRAINING IN THE ARMY.

By SENATOR L. DEL MAYNO.

Translated by F.E.B.L.

If we consult past records, what progress has the army made in fighting ability, or in other words, tactical training. I will here indicate the difference between 30 years ago and to-day.

At the former period a new spirit fluttered among the regimental officers under the acute stimulus of the surprises offered by the campaigns of 1866 and 1870-71.

But the mass of the officers slept a placid slumber. Content with the regulation catechism they sought nothing more, and nourished an instinctive antipathy to new ideas. The beneficient effect was not yet felt of the War School, which every year passed into the regiments better instructed and better equipped officers.

Also at that time some elect mind ardently desired progress, and discussed it in the press and in lectures. The General officers, the Corps Commanders and the superior officers for the most part stuck to the old customs, and in the manœuvres the employment of the various arms was imperfect; the management of large units, divisional, brigade, regimental, was heavy and methodical, and the study of the ground was little attended to.

It was at Verona that General Pianell started a tactical school which made a new and wholesome beginning in the fighting art of the various arms. Pianell, passionately fond of his profession, was tenacious in his methods and proposals, and gave an impetus which has not been lost, and which pointed out the way to take.

Among those who have rendered signal service to the country, Italy should never forget General Ricotti, who welded together the organic structure of the army; Pianell, who instructed it for 26 years; and that man of consummate modesty, General Cosenz, who, as a commander of troops, showed what could be done, while his character was adorned by every civil and military virtue.

He was the first and the only one who imagined and directed Staff rides with great skill employing the oldest Generals and Colonels. He published comments on the war of 1870-71, which were much appreciated for their thoroughness, and as Chief of the General Staff he advised a division of the tactical instruction which gave the best results. Finally he prepared silently the mobilization of the army in all its details.

The good seed thrown by these great masters and by other minor ones bore good fruit, and practice in Staff rides and in playing the war game contributed to the same result. But bad methods, bureaucratic pedantry, soon falsified the general characteristics and scope of the advance in tactical training.

He who has not the real management of troops—and only an intellectual management—is confined to abstractions, thoughts and meditations, and this mind work is a school, is a method, which becomes an acquired habit, and when such a one has the effective command of troops he preserves his thoughtful habit to the advantage of his own work and that of others. With these methods a conviction was acquired that single acts have no importance if no attention was paid to the connection between the divisional troops operating to the right and to the left. From this sprang the idea of mass and of co-operation towards a common object. It is not only a school of fraternity and of willing and ready co-operation, but also a guide to the individual initiative of all divisions, large and small, within the scope of the Supreme commander's instructions.

Italy has to-day an elect body of officers who work modestly and constantly to give to recruits the best possible general education combined with military instruction. It is consoling to state how much study there is in the army, especially in the infantry. Lectures were at one time, with rare exceptions, of small interest, and in fact only represented the product of ideas picked up here and there without personal imprimatur. Nowadays young

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officers tackle practical themes and give solutions of them worthy of praise. The bad habit of discussing trivial things has been abandoned, and attention is paid to the more serious problems of the varied military arts and sciences.

If I attend the manœuvres my heart swells as I note how everyone knows what to do at any moment of the action; how everyone has a clear idea of the whole movement; how all state in concise and precise terms what they intend to effect, and their own action in the matter; how everyone afterwards gives all his attention and passionate desire to master everything: at one time all this would have been sought in vain.

The new regulations, abolishing many of the old formal requirements, have for their sole object to make of a recruit a clever fighting man. Our officers know how to interpret these regulations in the best manner, and it is marvellous what they now produce in a few weeks, compared with former times.

With regret, however, I have remarked for a few years a stop, if not a retrogression, in the individual tactical ability of the infantry. Every one knows that modern warfare demands the willing and clever co-operation of every single combatant. The enormous effect of fire exacts from the soldier the utilization of every advantage of the ground so as to advance with the least exposure. To do this, practical instruction on varied ground is required, which it is not possible to obtain in forts or barracks.

As citizens we are glad to note the progress of agriculture and how from day to day we go on scattering seed on uncultivated land. But as soldiers this state of things, growing daily more acute as riches increase, creates for the army a very difficult situation.

I do not think I am in error if I affirm that in 70% of the garrisons it is impossible to instruct the soldier on varied ground; beyond the street one cannot go without causing damage and receiving the protests of the cultivators. There remains then only to explain to the soldier what he should do, without practical examples which, if repeated, would be engraven on his mind and ensure in him the habit of always doing the right thing: in a word the art of fighting usefully with the least damage to himself, and with the maximum efficacy of his own arm.

At the present time target practice is sufficiently accurate, and after the first few lectures in barracks the rest of the annual firing course takes about three weeks in which the regiment is taken to a suitable locality. In these circumstances, if Jupiter Pluvius robs none of it, five or six days are all that can be devoted to tactical instruction, and they are far too few. It becomes necessary thus to confine ourselves to the movements of platoons and companies instead of each individual man, which is, as it were, to read before learning to spell.

It is impossible that an instruction should be adequate in which the base has not been laid in individual tuition and making skilful, which is the requirement of to-day.

And of tactics on varied ground the only teaching was in the few days above alluded to, and in the week of the field manœuvres, where brigades and divisions were exercised in the movements of the larger units.

In these a single soldier is lost sight of. Commanding Officers must think of the movements of their divisions; they cannot direct, call to account or correct individual action.

I am of opinion that this defect in the system will soon bring us back to the old bad days. I remember in the brigade camps which lasted a month they were well able to develop a tactical course beginning with the smallest units up to two or three opposing regiments. I was glad to note that though they cared for their target practice they devoted to it fewer days, in order to have more time for rifle or tactical instruction, so as to give these the necessary development, and I hold it indispensable to re-establish the brigade camps which should last at least 40 days.

It is illogical to see the end in a few days of the prescribed lessons on fire discipline: it is to burn cartridges, to waste money, but not to teach.

To be useful the lessons should not be consecutive, but intercalated with the larger operations of the brigades. The soldier would thus acquire the art of firing well with calmness and technical efficiency. In the last 10 days one or two squadrons and two batteries would be added to the camp, because tactical instruction is not complete without the combined action of the three arms, which form a homogeneous whole by the concurrence of all: foot-soldiers, troopers and gunners. Organizing thus the field manœuvres of a brigade we augment its utility and importance, and the officers, in the last stage of instruction, must give their attention exclusively to the movements of their own divisions without minding to correct those of individual soldiers. There can be no doubt that with the proposed system the expense will slightly exceed the present outlay. Regiments would be on an average 18 days more in camp, but at least the necessary instruction of each soldier would be assured.

This provision has now become all the more necessary, as the term of service is about to be shortened. Twice only will the soldier receive instruction in fire discipline and tactics, and if the lessons are not given in a practically efficient manner their object will not be achieved of making men fit for war.

Every two years we have grand manœuvres. There is doubt that these exercises in mass are useful by so much as they teach soldiers and officers in the marching of complete divisions, or even larger units. They are useful because they develop, practically, encounters between large units to the advantage of commanders of regiments, brigades and

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divisions, and to the Head Quarter Staff officers who have to learn to overcome the difficulties of uniting, displacing and assembling troops. But it's little the junior officers gain either in these manœuvres or in war.

For some years it has been believed that we are approaching in these manœuvres nearer and nearer to the real conditions of war, leaving a freer hand to commanders of divisions. That idea at first seemed just, but if we look well into it, it is certainly not to the advantage of instruction.

War in time of peace is an irrational myth. Each side knows the other's strength, in war it is rarely so, also the ground is well known and is ours. Information, so difficult to get in war-time even with spies, is ridiculously easy of acquirement in manœuvres, what with wayfarers, motors filled with sightseers, and the chit-chat of every one. Fortunately there are no wounded, so one of the most difficult tasks of war is avoided. Field hospitals which ought to be provided with much care and difficulty are replaced by infirmaries established on the line of march long before the march begins.

Victualling, so difficult in war is facilitated in peace time by magazines leisurely supplied with food and forage. However if a troop should be stopped for the night at an unforeseen locality it will suffer more than in actual war. In fact, it is not lawful to requisition food and forage in villages and dairies, but care should be taken to observe the working of the various services of supply by the contractors engaged. Of real war there is here but the show; more cannot be expected. With manœuvres half-determined the Director can easily contrive that the two sides shall come into collision effectively three or four times, and that these shall have a good practical effect, so as to justify their great expense.

With free manœuvres however one side often advances with small forces, feeling its way, and the days pass with the small result of actions of secondary importance. It is certain that if the duration of the grand manœuvres could be prolonged, and the days of their execution not be rigidly counted, their lesson could be logically delevoped. But this will not be readily granted on account of its excessive cost. Nevertheless, the restriction of the time renders the manœuvres of an advantage more than problematical.

The direction of the manœuvres was entrusted to the Chief of the General Staff, a course of which I cannot approve. He alone among the General Officers who neither has nor can have in war the effective command of an army. His job in war is to help the Commander-in-Chief in the direction of the armies and to help their action, but the command of the forces belongs to the Commanders of the various Army Corps. Indeed the only occasion for exercising themselves in the management of large units is taken away from the General Officers appointed to command them and given to one who is quite out of his place. We must add that to confide the direction of the manœuvres always to the same officer, however capable, is to take away from the army opportunities to know and appreciate the individuals who fill the highest offices. The director crystallises his own methods, and during a long peace these inevitably become scholastic. The evident proof of that is the crowd of camp critics, and the army of informers chosen from among the most capable and active officers of every arm, taken from the various regiments, where their work would be more profitable, as if the Commanders of armies and of smaller units were not the only natural and authorised informers of the Supreme Commander.

Is this question of informers an institution suitable for war? I hold it to be superfluous, even dangerous. In fact the informers can only be of inferior rank, Captains or Majors at most, and these, impressed by a partial momentary situation, telegraph directly to Head Quarters what they see or believe to see. Head Quarters, in its turn, believing the report, gives orders to divisional commanders in the zone where the incident took place. Meanwhile probably the situation is changed or modified, and thence come orders, counter-orders and misunderstandings.

In war a great action is not directed like an orchestra, but only with directions which say clearly the object to be attained. The means must be left to the commander on the spot. He alone can know what was impossible to foresee, or if foreseen provided for; he alone should tell the Commander-in-Chief what has happened.

At most it would be useful if in every large divisional command there were an officer of the Head Quarter Staff exclusively employed in acquainting the Supreme Commander, through the medium of the intermediate authority, with interesting notices, even purely negative.

The reviews of the army corps on the same principle as the manœuvres, take place before officers of the highest rank, and they are useful because they give the soldier the idea of mass, and elevate his military spirit.

But I observe that the classes re-called to arms have but few days at their disposition to re-awaken the records and the practical habits of the past, to obtain adequate breathing time and have a few firing exercises at a target. The officers, all pre-occupied to smarten up those re-called to the colours and make a good show of them in the review about to be held in the honoured presence of the King, give to that all their care, with the loss of the other important instruction. To sum up, two more days of manœuvre would be more profitable than the review.

If our national balance were not so diminished through not checking ourselves but by means hurtful to the complex structure of the army, I should not in truth be opposed to the maintenance of the grand manœuvres. But these are very, very costly, and the money might be better employed in brigade camps, with

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one certain good result for the whole army.

Against this it is objected that the means are suppressed for practising General and Staff officers in the management of large units. So be it, but it may be observed that at most two army corps, one sixth of the whole, take part in the biennial grand manœuvres, in other words, one-twelfth of the whole per annum. But this is only a small matter. I am of opinion that with some ten thousands of francs annually we should obtain much more from Staff rides representing opposing armies.

Which is as much as to say that up and down half of the Generals every year would give proof of their own technical value, and would improve their already acquired knowledge of manœuvring. Also when grand manœuvres take place on ground of national military interest they should not evolve complete and positive schemes, because they would put in evidence the general conditions of the ground and its roads for the benefit of a possible enemy who has no intuitive knowledge of it. But being left unfinished they give every one false ideas.

Instead of manœuvres, by Staff rides, as said General Cosenz, who took part in them with real profit, two armies can fight for ten days on the French frontier with a realistic general idea, without diplomatic interference and without running the danger of revealing anything to our disadvantage.

This is the true school of Generals which brings out the exact value of each, which scorns fictitious reputations. This would prepare a future better than is promised by the present plan.

In conclusion, the tactical instruction of companies, especially in the infantry, is on the wane on account of the small time allotted to it. We must turn to brigade camps lasting for 40 days, and instead of grand manœuvres let us take advantage of the economical and profitable Staff rides of opposing armies which should be directed by the Chief of the General Staff.

When the country become rich and I will say also wise, shall understand that it must think seriously of the army and give it what it requires to be effective and strong, then let the grand manœuvres come. I am not sure I shall regret them, especially if well managed and subjected to real, not scholastic, criticism. It is not always pleasant to say what one conscientiously believes to be the truth, especially when unseasoned with the sugar and aroma of "how fine!" "how good!"

But it is the duty of a citizen and patriot to indicate what could be done better.

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Russian Quick Firing Field Artillery Equipment, Pattern 1902.

By C. BOYARD, Captain of Artillery.

Translated from the "Revue d'Artillerie," February—March, 1907,

By COLONEL A. H. C. PHILLPOTTS, late R.H.A.

The 1900 pattern although possessing remarkably good ballistic qualities was somewhat severely criticised during the Russo-Japanese war. The principle objections were the following:—

The gun was unstable when fired and it had to be run up after each shot.

The action of the indiarubber recuperator was too strong.

The gun was rather too heavy to be easily manœuvred in the mountainous regions of Manchuria, especially when the country was sodden with rain.

The absence of shields often led to considerable loss in personnel, so much so that many battery commanders rigged up improvised shields.

Consequently it was decided even before the war was over to adopt a new matériel called the 1902 pattern, with a hydraulic brake and stel spring recuperator, firing with a muzzle velocity of about 1900 fs., projectiles weighing 6·5 kg., at the rate of 20 rounds per minute.

Special points of the 1902 pattern equipment of 3 pounds.

The gun rests on the case containing the spring and is fixed in rear to the spring cylinder.

The spring box contains the hydraulic brake with the recuperator consisting of springs and carrying the sliding ways for the gun.

The gun carriage on which the spring box rests by means of trunnions. This gun carriage can traverse on the axle so as to give lateral direction. It has two axletree seats and a spade.

The gun. The inner tubes of 76·2 mm. (3 inches) calibre is of nickel steel. There is a jacket over the breech fixed to the inner tube by two forked rings and at the end of the breech there is the usual arrangement for fixing the gun to the spring cylinder.

Towards the muzzle is a band on which are fixed the copper ways to enable the gun to slide on the brake box.

The breech closing apparatus is of the Schneider pattern — a cylindrical screw with interrupted threads and central percussion firing—opening by means of a single motion of the lever to the right.

There is also an extractor and a safety arrangement.

Brake. The brake box is a long hollow cylinder on the upper portion of it the gun slides. It is also provided with trunnions by means of which it is pivotted on the gun carriage.

The brake cylinder is placed inside the brake box and the piston works inside the former.

The recuperator is composed of six helical springs of a flat rectangular section, the springs being kept apart by movable washers which prevent them riding on one another.

When the gun is fired it recoils on the spring box and pulls back with it the brake cylinder at the same time compressing the recuperator springs. Under this pressure the oil passes into the back part of the cylinder, the passage for it varying according as the piston is introduced.

The normal recoil varies from 99 cm., to 1·04 m. The piece at first recoils rapidly the movement gradually becoming slower until it stops.

Should air gain admittance to the cylinder or the oil become too hot the gun may not return properly to the firing position, but these defects are easily made good by screwing up the nuts.

The gun carriage consists of two steel plates joined together. The trunnions of the brake box pass through the upper part of the steel plates.

The axletree is of square section and bent, on it are placed the two axletree seats.

Laying for direction is arranged by the sliding of the gun carriage on the axletree; It allows a movement of 2° 45′ to right or to left.

The elevating gear is enclosed in a box placed between the brackets of the gun carriage.

On firm ground the gun carriage recoils during the first round from 10 to 15 cm., and each succeeding round only 1·5 cm. at most.

The lifting of the trail when firing at zero, the gunners seated, is from 1·5 cm. to 9 cm.

On soft ground the recoil at the first round may be as much as 75 cm., the wheels sinking from 9 to 15 cm., and the spade may sink as much as 25 cm.; but on hard ground it is almost nil in both cases.

After the first round the gun is completely unsettled and has to be relaid both for elevation and direction.

Instruments for laying. Direct laying is carried out by means of a curved tangent sight with a level of the Korrodi pattern. The sight is the same as that used with the 1900 pattern gun except

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that on the upper portion of the sliding cross bar there is a level surface for the goniométre.

Indirect laying is performed by means of the spirit level on the sight as well as by the goniometre.

The recent adoption of a panoramic sight of the Goerz pattern will probably lead to the new goniométre being abolished.

Ammunition. Three sorts of cartridges are supplied; service cartridges, blank cartridges, and drill cartridges.

Shrapnel which is of the usual pattern is the only shell and it is carried fixed in the brass case. The latter has a percussion arrangement in the centre. It contains 840 grains of smokeless powder which gives a muzzle velocity of 588 métres to the projectile.

Blank cartridge is made up in similar cases to the service cartridges and contains 200 grains of special smokeless powder.

The projectile for the drill cartridge is made of wood and fills the brass case. The portion projecting from the case is covered with leather. In place of the percussion arrangement in the base of the case there is a piece of indiarubber to save the point of ignition pin being broken.

The limber and wagon are of the usual pattern but it should be noted that there are strips of indiarubber under the seats on which the gunners are carried.

Details of weights and measurements.—

Total weight of gun	8 cwt.
Diameter of bore	3 inches.
Number of grooves	24
Length of gun	30 calibres.
Height of the axis of the piece when mounted	2·9 feet.
Height of the trunnions	2·3 ,,
Horizontal distance from the wheels to the end of the trail	6·6 ,,
Maximum possible recoil on the brake	3·2 ,,
Normal recoil rather less than above.	
Initial tension of the springs	5·24 cwt.
Track of the wheels	5 feet.
Diameter of the wheels	4·3 feet.
Pressure of the trail on the ground	10½ cwt.
Pressure on the axletree arm:—	
Field Artillery.—	
With gunners on axletree seats	1 cwt.
Without gunners	1·7 cwt.
Horse Artillery	1·7 cwt.
Total weight of gun and carriage in action.	
Field Artillery	20·8 cwt.
Horse Artillery	19·5 cwt.
Limber and wagon:—	
Length of the pole from the splinter bar to the point	9·3 feet.
Angle of stability about	35 degrees
Maximum angle of turning gun	75 ,,
Maximum angle of turning wagon	80 ,,
Weight of gun and limber packed without gunners	39 cwt.
Weight of wagon and limber without gunners	31½ cwt.
Ammunition:—	
Weight of shrapnel fuzed	14·3 lb.
Total weight of fixed ammunition	20 lb.
Number of bullets	260

Initial velocity of the projectile about 1960 fs.

Extreme range about 6,000 yards.

Approximate price of the principal parts of the matériel:—

	£	s.
Gun complete with breech piece &c.	183	
Gun carriage and wheels	166	
Limber complete without ammunition	41	
Wagon body complete without ammunition	75	
One round of ammunition	2	5
Gun and its carriage with ammunition and harness for the horses	1167	

Since the above mentioned pattern gun and equipment were adopted, the Russians have abolished the axletree seats and replaced them by a shield extending from one wheel to the other; it is divided into 3 parts, the middle part is fixed to the axletree, the two outer portions fold back on to the centre piece.

The top of the shield is nearly 5 feet from the ground, the lower edge reaches within ten inches of the ground.

The wagon is brought into action, perch to the front at a distance of about 12 paces in rear of the point of the trail and four paces to the left of the prolongation of the gun.

The wagon boxes are iron plated and open downwards so as to protect the legs of the gunners behind the wagon.

Consequent on the adoption of a panoramic sight the goniometric sight and fittings have been removed and the sight support strengthened.

The equipment altered as above will be called the 1903 pattern.

Observations. The Russians have retained an initial velocity of 1960 feet per second with this gun as they had for the 1900 pattern gun. They thus obtain a flat trajectory and a long range. It also increases the dangerous zone of the projectile while diminishing the angle of incidence.

But on the other hand the energy of recoil is increased and increases the work to be done by the brake. The length of recoil possible on the brake appears to be too little for the velocity attained by the projectile and it appears that the stability of the system gun and carriage cannot be as rigid as it is with the equipments of most nations.

The reduced weight of the limber and of the wagon body in Horse Artillery batteries seem to give all the mobility necessary; the weight drawn per horse being 5½ cwt. In the Field Artillery however, the weight pulled by each horse in the team is close on 8 cwt.

This weight appears excessive for horses measuring only 15 hands, and it would appear that the Russians have gone probably too far in sacrificing mobility to such an extent to power and rapidity of fire.

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Revue de l'Armée Belge.

January—February, 1907.

PRECIS OF CONTENTS.

Translated by LIEUT. K. B. FERGUSON, R.G.A.

1. The defence of Belgium (to be continued).

The present system, largely the work of the famous engineer Brialmont, makes the line of the Sambre and Meuse rivers the basis of defence, with fortifications at Liège and Namur. It has recently been attacked by a Belgian critic, General Dejardin, and a better known one, General Langlois. Though they do not agree with one another in detail, both are of opinion that the main line of defence should be thrown further back, upon Antwerp and Brussels, and the object of these articles is to refute their arguments and vindicate Brialmont. It is assumed throughout that Germany and France are at war with one another, and that either of them is apt to violate Belgian neutrality, in carrying out its strategic plans.

2. A study in fire effect (infantry). Continued from the last number of the Revue.

The author explains a new method of calculating rapidly on the field the relative fire effect to be expected against troops in various formations, at various ranges.

3. Conical bullets.

A study of the ballistics of the German "S" bullet and the French "D" bullet, pointing out their superiority over earlier designs.

4. The new Krupp 4·7″ (12 cm.) howitzer on long recoil carriage (recul constant).

A description of one of Krupp's latest designs for field howitzers. The writer gives full details of the construction and mechanism of this new gun, but unfortunately nothing is said about its ammunition, ballistics, etc., from which one might judge whether it is superior to existing designs. These details, however, are probably not yet available, as the gun is still in the nature of an experiment.

5. The fortifications of Brussels.

A brief article criticising, like the first one noticed above, only in more scathing terms, General Dejardin's views about the defences of Belgium.

6. The Grand Manœuvres of 1906.

Those who are interested in the account of foreign manœuvres will find it instructive to compare this article with the one on the same subject in our own official "Report on Foreign Manœuvres, 1906." What would Thomas Atkins say if he had to carry a weight of over 100 lb. in marching order, like the Belgian infantry! Roughly 7½ stone on his shoulders, up hill and down dale!

7. Hydraulic Buffers, their theory and construction.

A scientific and mathematical study (to be continued in succeeding numbers).

8. The employment of Cavalry at different stages of a campaign.

This article is written in reply to a series which appeared in recent numbers of the Revue, under the same title, and the writer of which is alleged to maintain that cavalry should be saved up to act after battles, in pursuit, etc. The present writer, on the other hand, emphasises their importance before and during battles, in reconnaissance, and as a screen for the movements of their own troops. The illustrations are drawn chiefly from the Napoleonic wars and the wars of 1870.

9. The Committee of the 2nd line of Defence at Antwerp.

A short account of the proceedings of this committee, which has been appointed by the Belgian Government to investigate and advise upon the best positions, etc., of the line of defence in question, which it has been decided to establish.

10. Current events, Notices of books, etc.

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HEAVY FIELD ARTILLERY IN GERMANY.[1]

Translated from "Revue Militaire des Armées Etrangères,"

MAY, 1907,

By CAPTAIN F. A. BUZZARD, R.F.A.

Part III. of the "Instructions for the Foot Artillery," containing the official regulations for the Training of the Heavy Field Artillery, or "Heavy Artillery of the Field Army," was published on June, 28th 1906.

This Artillery is now often referred to in Germany as "the fourth Arm of the Service," for it is considered that it no longer forms a highly technical branch, with which only Artillerymen and Engineers are concerned, but a component of the field army which will take its place on every large battlefield, and the tactical use of which will require to be understood by all.

It was in 1892 that the first teams were provided for the use of the "Foot" Artillery in time of peace. Since that date the use of these heavy guns, primarily intended for the attack of barrier forts on the frontier, has been gradually extended, so that the text book under consideration looks upon them as weapons to be employed "in all cases and in the same way as the other arms on the field of battle."

In the manœuvres of 1900, the Guards regiment of Foot Artillery played a brilliant part, and its success decided the authorities to allot Artillery of this nature to the field army.

According to the work under review, "the first object of the Heavy Artillery is to demolish the barrier forts or other frontier fortifications of a permanent nature in order to enable the field army to penetrate into the enemy's country. After this has been done, a small portion of this Artillery will be employed in connection with the siege of fortresses, whilst another, by far the more considerable portion will accompany the advance of the field army."

A short summary of the material with which the Heavy Artillery is equipped will help to make the distinction clear.

Material of the Heavy Field Artillery generally.

According to Bleyhoeffer, this consists of ordnance of three calibres:—

(a). The heavy field howitzer ('02) of 15 centimeters (6").

(b). The 21 centimetre (8·4") steel mortar.

(c). The 10 cm. (4") shielded gun.

In the text-book the use of the latter weapon is not mentioned, possibly because its great weight may have caused the authorities to reserve it for siege warfare properly so called.

The heavy howitzer (a), was introduced into the service in 1905. It appears to have been a conversion from an obsolete weapon, the actual "tube" and the ammunition of the latter being retained. By the addition of an hydraulic buffer and running up springs a rate of fire of from two to three rounds a minute per piece was obtained. If the ballistics of the former weapon were retained, this howitzer weighs, limbered up, 2700 kilos (52·7 cwt.). Its shell weighs 40 kilos (87·5 lb.) and has a bursting charge of 7 kilos 15·3 lb.), of high explosive. The maximum angle of elevation is 42 degrees.

A team of six horses enables this piece to keep pace with infantry on all kinds of ground, according to Berlin's "Waffenlehre."

The battery comprises 4 howitzers, 8 ammunition wagons, one observation wagon, one battery waggon, one forge and three wagons for supplies, forage and and baggage.

It is probable that 434 rounds per howitzer would be carried in the field, inclusive of those in the ammunition columns.

The 8·4" mortar (b), weighs nearly 5,000 kilos (4·9 tons) in action, and requires a special vehicle for its transport, which is followed by two platform wagons the weight of which vary from 3,000 to 5,000 kilos (2·9 to 4·9 tons). It throws a shell containing a heavy charge of high explosive and this shell can be made to explode with or without "delay action." It can only be moved at a walk, on very good roads, and a detachment of two companies of infantry is regularly attached in order to assist in its traction when necessary. It is only fired from a platform, and cannot open fire until four hours after its arrival at the position selected. The battery consists of four mortars, and 40 rounds per mortar are carried. The battalion consists of two batteries, a "light column" (colonne legère) and ammunition columns.

[1] This article is in the main a review of the official German Manual mentioned in the first paragraph. I have made a condensed Precis, but the original is well worth reading by those who are interested in Heavy Artillery.—*Translator.*

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The shielded 10 centimetre (exact calibre 4·12 inches) gun is of steel, a quick firer, and has fixed ammunition. It fires common shell and shrapnel, each weighing 39·4 lb. The shrapnel contains 680 bullets, each weighing ·38 ozs. This gun is about as mobile as the heavy howitzer, but can only fire from a platform. There are six guns in a battery. The range for time shrapnel extends to 8,750 yards, whilst the gun ranges, with percussion shell, up to 11,000 yards.

The employment of the different calibres.

The text-book under review makes very little mention of the last gun, described above, and it is apparently upon the other two pieces, (a) and (b) that the authorities depend for their Heavy Field Artillery. Of these only the former has sufficient mobility to enable it to be always up with the field troops. It alone can properly fulfil the double role of being available both for fortress and field warfare.

The heavy mortars (b) would only accompany the field army in its advance for some very special purpose. The regulations say:—Their action is limited to the attack of strongly fortified positions and of barrier forts, whilst the heavy howitzers are employed, like the other arms, on the fields of battle in open country." The work also says:—"The battalions of howitzers suffice to take the place of the Field Artillery in the attack upon fortified positions, and they are also equal to the task of checkmating the action of the barrier forts; but, in order to capture the latter, the mortars would be required."

The Attack upon Barrier Forts.

The regulations devote a chapter to the question of attacking a line of forts d'arrêt, or barrier forts, with the object of preventing their interfering with the freedom of movement of the invading army.

In spite of the powerful weapons which can be brought to bear upon such forts, Bleyhoeffer says that they will be able to hold out for four days, but acknowledges that their mission, which is to hinder the movements of the invader's field army, will be impossible to carry out and that their whole energies will be taken up in the work of self defence.

The Heavy Field Artillery properly so called.

This will be constituted by the battalions of heavy howitzers, as already pointed out. The question remains,—how many of these will be allotted to the various German armies?

Official publications, whilst giving in detail the proportion of Field Artillery allotted to each army corps, are silent as regards the amount of Heavy Field Artillery which may be expected. To judge from the opinions expressed by various authors, and some indications given in the official text-book, it is intended to employ this Artillery in "mass," battalions not being split up. It seems probable that there will be corps Heavy Field Artillery, and that one battalion will be allotted to each army corps.

Its place on the Line of March.

The German Field Sevice Regulations were amended, with regard to this question, on October 8th 1903, to read as follows:—"The Heavy Artillery will march as a rule in rear of the infantry of the main body; but, if an attack upon a hostile position is anticipated, it will be pushed on close enough to the head of the column to ensure its opportune arrival in action. In such cases the observation wagons will be place with the advanced guard at the commencement of the march, and the reconnoitring officers will be sent forward at the earliest possible moment."

The distribution of the Battalion of Heavy Field Artillery on the march will be approximately as follows:—

(a). The reconnoitring officers, each escorted by six mounted men, will, in company with the cavalry patrols. reconnoitre to the front and particularly on the flanks in order to try and locate the defence works of the hostile infantry, the positions prepared for his Field Artillery and, if possible those for his heavy guns. (Bleyhoeffer).

(b). The commander of the Heavy Field Artillery, accompanying the Staff of the Commander of the force to which the batteries are allotted. (Vide para. 137, of the Regulations).

(c). The battalion and battery observation wagons, in rear of the advanced guard. (Vide para. 138).

(d). The "firing batteries" (each of four howitzers and four wagons) and, immediately in rear, the "first line of wagons" consisting, for each battery, of four ammunition wagons and a battery wagon). These would be as close to the head of the column as was compatible with the timely arrival on the field of battle of the other troops.

According to Bleyhoeffer, "In the case of an army corps marching on a single road to the attack of a fortified position, the batteries of Heavy Artillery should be at least in rear of the leading division. If such batteries are attached to a single division marching on one road, their place should be in rear of the Field Artillery."

(e). The "light columns" immediatly in rear of their battalion until the Heavy Artillery is called to the front, afterwards in rear of the combatant troops, immediately behind those of the field batteries. (vide para. 205 of the regulations).

(f). The ammunition columns remain with those of the infantry and Field Artillery.

The general role and method of employment of Heavy Field Artillery on the Battlefield.

The German text-book says:—"The principal role of the Heavy Artillery is

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to co-operate with the Field Artillery in bringing a crushing fire to bear upon the point chosen by the commander of the force as the main objective for his infantry attack. But, in order to ensure the success of the latter, it is indispensable that one should first obtain superiority of fire over the opposing Artillery. This, therefore, will be the first aim of the Heavy Artillery, acting in concert with the Field Artillery, of which it is the essential support." Bleyhoeffer hopes that the long range of the Heavy Artillery may enable it to cover the Field Artillery coming into action, and this hope is shared by the regulations. (Para. 145).

As a general rule the Heavy Artillery comes into action as a complete battalion, but may, exceptionally, work by single batteries. Effect is said to be gained by having all the batteries of a battalion together, but the regulations consider that it is not of any use to collect more than one battalion on a position.

The time honoured German principle of bringing as great a force of Artillery as possible in masses, from the outset of a battle, is adopted for the Heavy Artillery, but a note of warning is given against using its ammunition, which is relatively small in amount, against targets which are not worth the expenditure of rounds.

Co-operation with the Field Artillery is the rule, and it is considered to be of such importance that the Commander of the troops himself should specify when necessary, the missions to be fulfilled by the Heavy Artillery alone. (Para. 187).

The regulations anticipate that shielded batteries, strong field works, trenches, localities, and woods of full grown trees, will offer the most suitable targets for the Heavy Artillery.

Reconnaissance.

This is carried out by special officers, each. provided with an escort. They would move with the advanced guard, and, according to Bleyhoeffer, three would be required as a rule, one working to the front and one on either flank. They must endeavour to locate the hostile gun positions and works of defence of all kinds. These officers would be aided in their task by a general knowledge of the principles of fortification in use in the enemy's army. During the battle they would endeavour to give information as to the results of fire, etc., and if possible they should be in communication with the Commander of the heavy battalion by telephone. Failing this, mounted orderlies, cyclists or signallers must be used. Balloons might be useful in locating hostile batteries in covered positions and for regulating the fire.

Helped by the information given by these officers, the Commander of the Heavy Artillery, who makes his own reconnaissance in company with the Commander of the forces, decides upon the distribution of his battalions, and the commanders of the latter in turn reconnoitre their positions and give their orders to the battery commanders. All reconnaissance must be most carefully conducted so as not to attract the attention of the enemy, and it will generally be carried out on foot, without escort.

Choice of Positions.

The Heavy Artillery should be brought as close to the enemy as is possible whilst keeping out of sight, in order to make full use of the power of its fire. At the same time it will often have to come into action at long ranges in order to cover the advance and deployment of its own troops, especially in the attack upon fortified positions. In some cases it may have to take up positions in rear of its Field Artillery, and it will seldom be possible to avoid firing over the heads of friendly troops.

A position should enable the best possible effect to be obtained, and if this is assured, it should be covered from view if possible. Defiladed positions are the rule. (Para. 147).

Positions in the middle of woods or in clearings are generally excellent as they are altogether concealed from the view of the enemy, even if the latter possesses balloons. (Bleyhoeffer).

The Occupation of Positions.

Positions should be occupied unseen, and every endeavour made to let the opening of fire come as a surprise to the enemy. In some cases it may be necessary to cross fire swept zones at night in order to avoid undue loss, especially in the attack upon fortified positions. The occupation of the position should be rapidly carried out. All means should be used to prevent delays. The horses will have fulfilled their mission if they have brought the pieces into position, even if it be with their last remaining strength. Any assembling in a preparatory position behind that to be occupied will be exceptional. In the attack of fortified positions, the Heavy Artillery would be entrenched, and a complete system of communication by telephone etc., would be established between the batteries, the various Artillery commanders, the reconnoitring officers, and, if they are in use, observation balloons.

Changes of position would be rare. When undertaken, they would be carried out by batteries.

The Conduct of Fire.

The field howitzers (light), and the heavy field howitzers would be employed against the most important and strongest objectives, but, if the latter cannot be located at first, it is preferable to hold back both these classes of howitzers.

In order to ensure co-operation, the supreme control of the Artillery would be entrusted to the senior Artillery officer present, as a rule the Colonel or General Commanding Field Artillery. This officer's special duty would be to see that the fire was well and appropriately distributed over the whole area to be at-

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tacked. Battalion commanders are responsible for the fire tactics of their battalions.

In the Artillery combat, every effort will first be made to over-power the hostile Heavy Artillery, the powerful shells of which might seriously interfere with the deployment of one's own troops, especially of the Field Artillery. The howitzers, as a rule, would carry out this task, but it might have to be confined to the field gun batteries firing time shrapnel, in cases where the opposing guns could not be accurately located.

The howitzers would next be useful in engaging shielded field batteries, which are difficult for field gun batteries to deal with. Once the superiority of fire is attained, it would be the task of certain specified batteries of field guns to keep the enemy's Artillery under observation and deal with any attempts at re-opening fire, whilst the remainder of the field guns would co-operate with the heavy and light howitzers in preparing the way for the infantry attack. It is of the utmost importance that the infantry should push on in order to force the defenders to occupy their lines and show their troops. It is the main duty of the commander of the attacking side to push on the infantry under cover of the Artillery fire in order to effect this. The Heavy Artillery has therefore to increase the intensity of its fire when the defenders show themselves, especially against those parts of the enemy's line at which the infantry fight appears to be most active. It should keep this fire up as long as it can without endangering its own troops. It is necessary in order to effect this, that Artillery officers should be sent forward with the infantry. These officers, connected by telephone with the battalion of Heavy Artillery, should send back word when the infantry have arrived so close to the position that the fire of the Heavy Artillery must be turned to the flanks or on the ground behind the enemy's front line.

Views opposed to the Introduction of Heavy Field Artillery.

As is well known, General von Alten, wrote very strongly against the light field howitzers, and his arguments would apply equally to the heavy type. The following views against the "new arm" are those expressed more recently by an officer of Field Artillery, Major Ruppel.

(a). Under exceptionally favourable conditions it is possible, after using up the contents of eight ammunition wagons, to destroy 120 metres of trench, occupied by one company, when using the heavy howitzer. But can the assault be thereupon commenced? By no means. When attacking a barrier fort, where the defenders are all confined in a small space, the howitzer can prepare the way for the assault perfectly well, by reducing the work to ruins. But, in field warfare, the the time is not ripe for the assault merely because one may have destroyed the trenches of a small portion of the position, (say on a front occupied by two or three companies), especially as the slow process of ranging with high angle fire will have given the defenders ample time to evacuate the trenches in question without loss. One cannot hope for any results against an extensive position from high angle fire with percussion shell. The only sound method of attack is to push forward infantry energetically so as to force the defenders to expose themselves to Field Artillery shrapnel fire.

(b). Against Artillery behind cover, some effect was to be looked for from progressive time shrapnel fire from guns when the covered Artillery had no shields; but against covered and shielded Artillery this method would result in a mere waste of rounds. It is a mistake to expect better results from the howitzer. To attempt to carry out progressive fire with howitzers firing percussion shell would entail such an expenditure of ammunition that the adoption of this method would mean that the number of wagons, already large, would have to be doubled or even trebled.

(c). In order to avoid this engagement of shielded guns behind cover, we should force the enemy to expose himself by the threat of a vigorous infantry attack. The Artillery fight is no longer a phase of the battle during which the infantryman plays the part of a passive spectator. But, having succeeded in making the hostile Artillery come forward to a "half covered" position, we shall find that the heavy howitzer is still unfitted to the task of engaging it. The difficulties attendant upon observation will still be far too great to enable the range to be found with that exactness which is wanted in order to render high angle fire with percussion shell effective.

(d). We cannot therefore count upon any effective action on the part of the howitzer except for the purpose of destroying Artillery which is completely exposed. But, against such a target, it takes on the average 25 rounds to get a direct hit with the howitzer, and only 14 rounds with the gun. This represents projectiles weighing 86 kilos (188 lb.) with the gun, and 987 kilos (2150 lb.) with the howitzer. In other words, with the same expenditure of ammunition one would obtain eleven hits with the gun as against one hit with the howitzer.

The former is therefore infinitely to be preferred to the latter.

In conclusion, the heavy field howitzer is necessary in order to force the first line of barrier forts. They will accompany the army further during its advance because their special attributes may be called for by certain objectives of a similar nature in the course of the campaign. But, in order that they may be used advantageously on the field of battle, they should be capable of low trajectory fire, and be provided with shrapnel and shields. As long as these conditions are not complied with, *these weapons should not be allotted to Field Armies in greater numbers than are necessary to provide for the reduction of barrier forts.*

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It will be seen that there is a vast difference between these conclusions and those indicated in the official text-book. Which are correct? It is always easy to answer a question of this kind by saying that the experience of war alone can provide the solution. But in the present case this device of eliminating the unknown does not solve the equation.

The question as to whether Heavy Field Artillery will justify the large sums necessary for its establishment is one which is confronting many reflective minds in Germany and elsewhere.

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CONTENTS.

"Notes on Masked Fire." Translated from the "Revue d'Artillerie," February—March, 1907, by Col. A. H. C. Phillpotts, late R.H.A. 219
"Field Observatories." Extracted from the "Revue d'Artillerie," April, 1907, by Colonel A. H. C. Phillpotts, late R.A. 225
"Q.F. Guns in the Russo-Japanese War. Translated from the French of Major C. de Castres de Tersac, by Lieut K. B. Ferguson, R.G.A. 229
"Revue Militaire des Armées Etrangères." Précis of contents. By Captain F. A. Buzzard, R.F.A. 233
"The Heavy Artillery of the Field Army in France." Translated from "Neue Militärische Blätter," April, 1907, by Captain F. A. Buzzard, R.F.A. 234
"The New Field Artillery Regulations." A Précis from "Neue Militärische Blätter, by Captain F. A. Buzzard, R.F.A. 235
"Revue de l'Armée Belge." Précis of contents. By Lieutenant K. B. Ferguson, R.G.A. 237
"Streffleur's Militärische Zeitschrift." Précis of contents. By Lieutenant C. O. C. Hunt, R.F.A. 237
"Les Spectateur Militaire," February, March, April, May, June and July. Précis of contents, by Major E. P. Smith, R.F.A. 238
"Artilleristische Monatshefte." Précis of contents, also Précis and short notice. By Lieut. T. G. Anderson, R.F.A. 241
"Vierteljahrshefte für Truppenführung und Heereskunde." Précis of contents. By Lieut. W. E. Ironside, R.H.A. 245
"Journal des Sciences Militaires." Précis of contents. By Lieut. C. O. C. Hunt, R.F.A. 246

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Notes on Masked Fire,

By E. THOUVENIN, Squadron Commander, French Artillery.

Translated from the Revue d'Artillerie, Feb.—March, 1907.

By COLONEL A. H. C. PHILLPOTTS, LATE R.H.A

THE different problems which occur at masked fire may be quite easily solved if the elevation expressed in thousandths of a metre for the different distances are known.

In any case, the greater number of the proposed methods of procedure for the solving of these problems take for granted that the angles of sight of the hidden object and of the target are known. Consequently there is a necessity for the employment of some apparatus for measuring these angles.

Several apparati of this sort have already been under trial and have given fairly satisfactory results, but there are certain cases, and these the most usual, where it is not very easy to use them. For example, when the observation post is at a different height to that of the battery or perhaps is at some distance from the battery,

Besides, with these instruments the exactitude of the instrument is very often somewhat doubtful owing to want of knowledge on the part of the operator.

The simple and very quick methods which are now about to be described are only based on the measurement of differences of angles. They do not require an apparatus for the measurement of angles of sight and can be used in every case.

In addition, by these methods it can be discovered whether it is possible to fire over the target and at what distance, but also to know or to choose the amount of defilade.

The method of procedure takes a shorter time to carry out than to describe. The officers who have employed them during instruction and at the schools of instruction recognize that no delay in the opening of fire is caused by them.

It often happens on the other hand that the length of time taken to open fire is reduced owing to there being no doubt as to the choice of the gun platform.

The different measures that have to be taken need not be accurately carried out provided that everything is arranged in the most favorable way for safety.

Method of calculating the elevation in thousandths:—

The simplest method seems to be to keep in memory the formula $3H - 10$, in which H represents the distance in hectométres.

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EXAMPLE.

Range métres.	Angle of elevation calculated by means of by the formula.	by range tables.
500	$3 \times 5 - 10 = 5$	7
800	$3 \times 8 - 10 = 14$	15
1000	$3 \times 10 - 10 = 20$	20
1500	$3 \times 15 - 10 = 35$	33
2000	$3 \times 20 - 10 = 50$	48
2500	$3 \times 25 - 10 = 65$	65
3000	$3 \times 30 - 10 = 80$	84

By this we see that up to 3,000 métres the formula gives very exact results, and that is amply sufficient, for in all that follows, the distance under consideration is not the distance to the battery from the point which it is required to fire at, but the distance from this point to the screen, that is to say, the dead angle. Whatever, therefore, may be the distance of the objective of the moment from the battery, it seldom does to allow a dead angle of more than 3,000 métres.

General theoretical solution:—

Let M be the apex of defilading bank, (fig 1).

O, the position of the battery.

B, the nearest point which it is desired to hit without changing position.

D, the distance BM of this point from the same; and n the angle of elevation corresponding to the range D.

In order to be able to fire from O to B above M, it is merely necessary that the angle MOB should at least be equal to n thousandths.

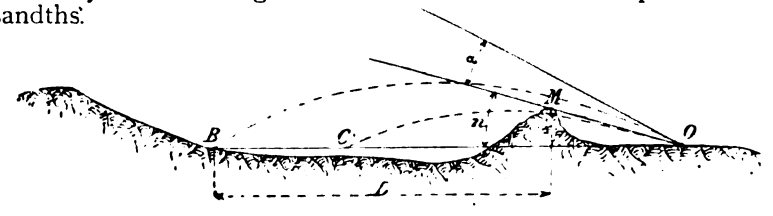

Fig. 1.

As a matter of fact, if we fire with an angle of elevation equal to n thousandths, the projectile would touch the line OB at a point C, such that OC = MB and consequently CB = OM.

In order to reach the point B, it would be necessary to fire with a greater angle of elevation, $n + a$.

To wit, whatever D may be, a must always be greater than the angle of elevation which corresponds to the distance OM since OM = CB. Consequently the trajectory OB will cut the line OM beyond the point M, and consequently will not hit the screen.

First special case:—

The battery is behind a wall, a hedge, a wood, a village, &c., and the Captain standing on one side and on the same level as the

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guns, sees before him the apex of the traverse, and to one side of him the object (by the word "object" we always understand the nearest point of the traverse which the Captain desires to hit without moving the battery).

Suppose 1,500 métres is the distance from the object to the traverse, the corresponding angle of elevation is 35 thousandths.

The Captain moves, the rule in his hand, his finger on division 35, and halts when he sees the top of the blindage at 35 thousandths above the target.

He takes note of the amount of movement while looking at the height of the traverse above the point from which he wishes to move.

If this movement is above 4 métres, he can move further, either to give facilities for covering with fire the nearer points, or in certain cases to profit by a lateral cover which will conceal him from other points of the ground occupied by the enemy.

If the movement is less than 4 métres, as he cannot move except to get further from the screen, he can assure himself in doing so that he does not still further reduce his movement, which does happen when the line of movement meets the ground behind the battery.

Second special case:—

Fire against the slope of a hill.

The battery is behind any sort of cover, the Captain placed behind the battery at C (fig. 2), sees the target above the cover.

The Captain decides on the position of his guns for 4 métres movement in the following manner.

He moves to A on the line of cover from the point B, the highest point from which he wishes to cover himself. He sends the Quarter Master Serjeant in front of him and stops him at O when he sees his head at double the height of a man above the line AMB.

If the covering crest is sufficiently far away, it will not as a rule be necessary to verify the possibility of firing, if, however, he deems it necessary, he can proceed as follows:—

He moves to C on the line of cover from the target B and measures the angle X between this line and the head of the Quarter Master Serjeant, or preferably an observation taken beyond the Quarter Master Serjeant.

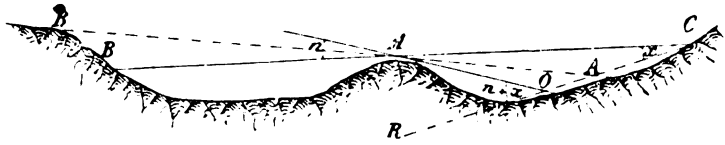

Fig. 2.

Then he moves to where the Quarter Master Serjeant is, and measures the angle MOR, if this latter is equal or less than $n+x$, the firing can be proceeded with; if it is greater, the Captain moves back until this condition is fulfilled.

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Third special case :—

Fire above a distant crest, the Captain's point of observation being on this crest.

Let 2,000 métres be the distance of the point B (fig. 3), and consequently $\frac{50}{1000}$ the angle of elevation.

The Captain points out the point B to his Quarter Master Serjeant and works with him as follows :—

Turning his back on the target he places himself so that his eyes are nearly on the line BM.

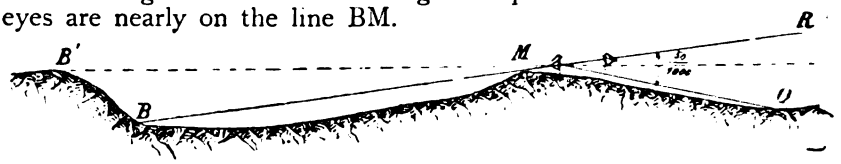

Fig. 3.

At some paces from him, the Quarter Master Serjeant, turning towards him places himself so as to see the point B projected on the line of the Captain's eyes.

The latter taking his rule measures the angle between the line MR (line of the Quarter Master Serjeant's eyes) and a line MO making below the latter an angle of $\frac{50}{1000}$.

To enable him to fire, it is necessary that the muzzles of the guns should always be above the line MO. If then this line meets the ground, it is clear that one can place oneself any where behind this crest. The only thing remaining to be done is to determine the position of the guns according to the amount of defilade required.

Let B^1 be the point from which it is required to conceal the battery.

The Captain and the Quarter Master Serjeant recommence the operation for the point B^1 which we have just described for the point B.

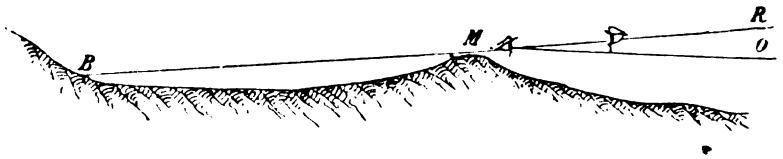

Fig. 4.

When the Captain has thus measured the prolongation of the line MB^1, he causes some man to walk back until he sees his head at double the height of a man below this line MB^1.

At this point the muzzles of the guns will be about 4 métres below the line of defilade.

If in the first operation the Captain has established the fact that the line MO (fig. 4) will not hit the ground, he determines the most distant position he can occupy while making the man go back until the line MO cuts it at the height of his waist.

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At this moment he stops him and estimates as we have said, the amount of defilade there is at this point and beyond which it is not possible to pass.

If there should be too little defilade, the Captain will have to decide to increase the distance to which he will be able to fire and to admit that if circumstances require him to fire against the point B, he will have to make a bold move so as to get near the crest.

On the other hand, slopes being seldom regular, it often happens that the line MO being at first raised above the ground will cut it a little further. It is then in the neighbourhood of this latter point that the battery will be placed.

Fourth special case:—

Fire against a hollow behind a plateau, the Captain being obliged to be in front of the crest.

1st. If from his observation post the Captain sees the position of the battery, he can proceed as previously pointed out.

2nd. If he does not see the position of the battery, he selects M^1 (see fig. 5), a position from which at the same time, he can see the observation post and the battery. He there plants a picket where he leaves a man. Two cases then present themselves.

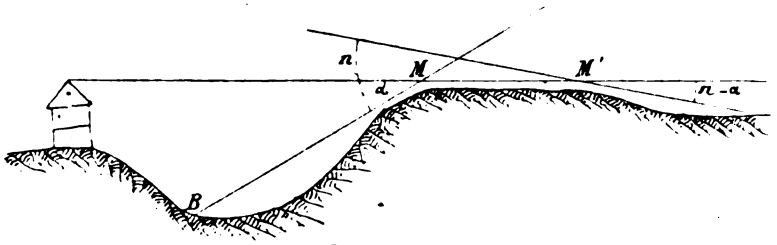

Fig. 5.

(a). From M^1 he of course does not see the target, but can see the tops of the trees or the roofs of houses.

In this case, he measures at M the angle of depression a between the point B and the roofs of houses, and he at once applies at M^1 the third method, putting n for $n-a$ and the target by the roofs of houses.

(b). From M^1 he sees nothing in the direction of the target except of course, the observation post M.

In this case, he measures at M, the angle of depression a between the direction of the target prolonged and the lirection MM^1, then, leaving a man or a picket at M, he moves to M^1 and applies the third method substituting the target for the observation post M and n by $n-a$.

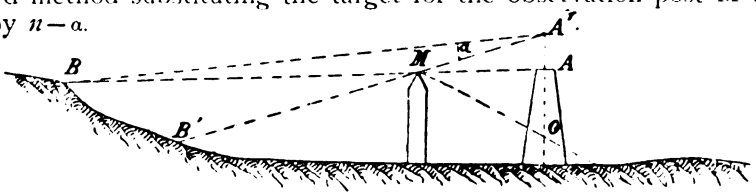

Fig. 6.

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Fifth special case:—

The case of an observation post raised above the ground,—house, tree, battery cart, ladder, &c.

The Captain observes from above the covering crest by means of an observation post which is not either on the crest or at the same height as the battery.

The Captain first places his eyes on the line of defilade from the target at A (fig. 6) then at 1 mètre higher at A^1, so that he is able to observe an extent of ground BB^1 in front of the target.

He measures the angular error $BAB^1 = \alpha$ between the target B and the nearest point B^1 which he obtains thus:—

Let $\alpha = \frac{25}{1000}$. If MB = 2000 m. $n = \frac{50}{1000}$

To be able to fire it is necessary that the muzzle of the gun should be above the line which joins M and a point O placed 2 mètres below A $(2 = \frac{n}{\alpha} = \frac{50}{25})$.

If the observatory is less than 2 m. he can place his battery at the very foot of the observatory, unless he should find the defilade insufficient and that then he can increase it by going back to a place behind, which can be verified as we have seen already.

If the observation post is more than 2 mètres high, he goes back until the line from the muzzle of the gun to the top of the screen passes 2 mètres below A.

Austria-Hungary.

Re-organization of the Field Artillery.

Extracted from the "Revue d'Artillerie," April, 1907.

By COLONEL A. H. C. PHILLPOTTS, late R.H.A.

Austria-Hungary. Reorganization of the Field Artillery.

Besides the two Regiments of divisional artillery, the Corps Commander has at his disposal three other Regiments of Artillery, of which two are howitzer regiments. There are at present 42 divisional field artillery regiments for the 14 army corps. There are still to the formed 14 howitzer regiments and 14 ordinary field artillery regiments. These last 28 will be found by the Landwehr.

The regiments will be each composed of two groups of 3 batteries each. The battery will have 6 guns in place of eight as heretofore.

Such is the outline of the programme which the Minister of National Defence will lay before the Austro-Hungarian Parliament.

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FIELD OBSERVATORIES.

Extracted from the "Revue d'Artillerie," April, 1907.

By Colonel A. H. C. PHILLPOTTS, late R.H.A.

FIELD OBSERVATION POSTS.

ALTHOUGH the question of masked positions for artillery still gives rise to very lively discussion, still speaking generally we may admit that in a great number of cases, artillery will have to be concealed. With this end in view, artillery will have to be placed behind and about 25 or 30 feet below some cover.

In order to observe his fire, the Captain will have either to move away from his battery and communicate with it by signal, telegraph or telephone, or else remain with his battery and employ some arrangement of mirrors of the nature of a periscope, or make use of an observatory.

The first alternative meets with very little approval from any one for the Captain is taken away from the effective direction or supervision of the battery.

In default of a regulation observatory many officers have endeavoured to utilize the battery matérial in order to rig up an inexpensive improvised observatory allowing the Captain to be raised to a height of 4 to 6 metres. The following is a short description of some of these arrangements. We will also describe shortly the Schneider-Canet observatory intended for the Spanish matériel and for the Portuguese matériel.

CAPTAIN PIERRE'S OBSERVATORY.

To construct this as shown in figure 1. A rammer, a spare pole bar and a dragrope are requirel fixel on to the perch of a wagon turned on end. The operation takes about a minute and the observer is raised about 14 feet.

Lieut. JARICOT'S OBSERVATORIES.

Observatory No. 1 in which the ammunition is packed.

Three limbers are arranged so that their poles meet, the limbers being tipped up, the poles are fastened together at the top by means of the pole chains. The observer sits on the top of this pyramid gaining access to the post by means of an improvised ladder. He is raised by this means about 17 feet from the ground. Figure 2 shows the arrangement.

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FIG. 1.
Captain Pierre's Observatory.

FIG. 2.
Lieut. Jaricot's Observatories.

Observatory No. 2 for empty limbers is similar to the above but the limbers being empty as they would be in peace time, they have not the same tendency to upset as they have in No. 1, and are more easily fixed at their pole points.

FIG. 3.

FIG. 6.

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Observatory No. 3. Equipment either empty or full.

The limbers are placed as before but their poles are joined at the top by means of an iron hoop, on which hoop is hung a small platform and the improvised ladder. (Fig. 2a).

The appearance of the whole is shown in Fig. 3.

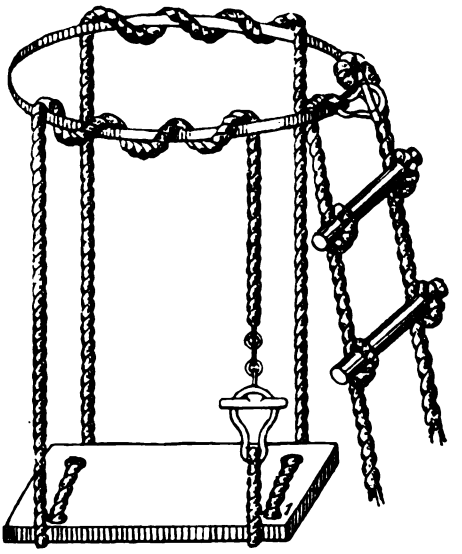

Fig. 2a.

CAPTAIN OHRESSER'S OBSERVATORY.

The apparatus is constructed by means of steel ladders erected against a wagon body. In the diagram (fig. 4) OB and CAF are two similar ladders. At AB are two tubular rods, fixed at B by means of a pin to the ladder OB and to the ladder CAF by means of collar at A. The two ladders and two tubular rods are carried on the wagon body and the arrangement takes about a minute to erect. The weight of all is 37 k.g. and the price about 35 fr. (28/-).

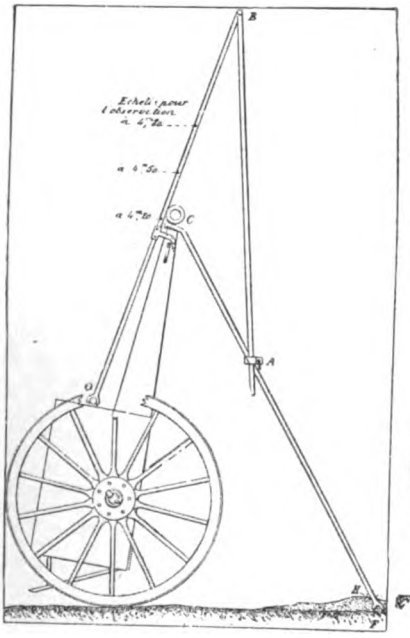

Fig. 4.

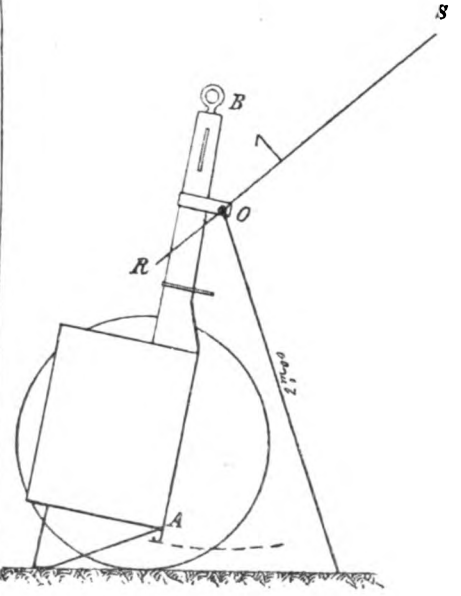

Fig. 5.
Captain Repelin's Observatory.

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CAPTAIN REPELIN'S OBSERVATORY.

It consists of a jointed ladder formed of two unequal arms, pivoted round a horizontal axis parallel to the axle. The longer arm OS is equal to the distance OA. OR being equal to OB.

The extreme height to which, when elevated, the ladder reaches is 3·75 m. (12 ft.) which brings the eye of an observer 4·40 m. (14½ ft.) above the ground.

The weight of the ladder which was used at practice camp was 28 k.g. (62 lbs.).

CAPTAIN PIERRE'S OBSERVATION LADDER.

Is made up of two distinct portions, made like a fire escape and fastened against an upturned wagon body.

When folded up, the ladder is placed on the top of the ammunition boxes on the wagon body, but care has to be taken that it is not too near the limber.

When the wagon boxes are full of ammunition the ladder is absolutely stable and there is absolutely no fear of its falling. When empty, a certain amount of swaying is possible but this can be completely overcome by putting on the brake.

THE SCHNEIDER-CANET OBSERVATORIES.

The Schneider-Canet Company constructs bullet proof observatories mounted on the perches of the wagon bodies of all the different patterns of quickfiring equipments which they make. Some are detachable and others fixed.

Fig. 6 sufficiently describes the appearance and arrangement of this piece of mechanism.

When travelling, the two portions of the upper part or shield are carried one on the other on the limber. The lower portion is turned back and secured on to the support.

It can be arranged for three different heights of observation. Namely, 10 feet, 11 feet and 12 feet.

There are two steps half way up the perch to assist the observer in mounting to the observation step.

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Q.F. Guns in the Russo-Japanese War.

Translated from the French of Major C. de Castres de Tersac,

By LIEUT. K. B. FERGUSON, R.G.A.

Before the Russo-Japanese war began, military writers foretold wonders from the new Q.F. guns, with their extraordinary power, their rapidity of fire, and from the general progress they indicated, which would lead to the death and destruction of all they opposed. A great many held that the influence of the new Artillery in a battle would be decisive. Now the war is past, however, it is only found to have been important, while it has even been said that Q.F. Artillery did not come up to expectations.

On the outbreak of war, Russia was surprised in the act of renewing her Artillery. As early as 1901, she had began to manufacture a Q.F. gun of 2·98″ calibre, but there had not been time to issue it to all the army, and it was as much as the Russians could do to get the units equipped as they were sent out to Manchuria. If we compare this gun with its Japanese rival, we find that though neither of them was a perfect Q.F. gun, in that neither overcome the difficulty of not jumping off the target at each round, yet the Russian was the better of the two. It had greater initial velocity and rapidity of fire, but it was inferior in mobility. Neither of the two had shields. The Russian gun fired only shrapnel; the Japanese had, in addition to shrapnel, a shell called Shimose, after the inventor of the explosive which formed its bursting charge. The Russian battery had 8 guns, under a Lieut.-Col. and two Captains (there is no rank of Major in the Russian army); the Japanese battery had 6, and their gun was the Arisaka 2·95″ Q.F. of 1898. The Rusians only received the drill-book for their new gun four months after the war began; so it is not surprising that they were somewhat unpractised in the use of it.

The French drill-book says: "Rapidity of action is the essential feature of Field Artillery; and it springs from two fundamental attributes of the gun,—rapid and powerful fire, and the opportunity of acting by surprise." These attributes were frequently brought into notice during the Russo-Japanese war.

On April 30th 1904, Kuroki crossed the river Yalu just below its junction with the river Ai Ho. The Russians were in position on the hills on the right bank of the river, hills about 300 feet high, which were rendered all the more difficult of approach by the bare and entirely exposed stretches of sand, intersected by arms of the river, over which the Japanese had to advance. But the Russians had only three batteries in position there. A fourth was out of reach at Antung, and two others were kept in reserve in the same neighbourhood; the Japanese had made skilful demonstrations lower down stream which drew off the enemy's attention from the real objective.

The Russians moreover, had placed their guns out in the open on the crest line or on the near slope of the hills; and their trenches could be seen, symmetrical and conspicous, from where the Japanese stood, while the latter, on the other hand, had taken minute precautions to conceal their guns. They had scattered trees and foliage around the epaulments, constructed splinterproof recesses for men and ammunition, and even dug canals to flood the ground near their guns so that the blast should not throw up clouds of dust. They had also raised observation posts some 2,000 yards from the guns, connected with the latter by telephone.

On May 1st., at 6.30 am., three Japanese divisions marched down to the river Ai Ho, to cross it. One of the Russian batteries on the opposite heights opened fire on the Guards Division; but the Artillery of this Division which had been watching the hostile guns as a cat watches a mouse, immediately replied, and destroyed it in a few moments.

Another Russian battery next to this one tried to move into a more favourable position; but a lucky Japanese shell disabled one its carriages in a defile, and the whole battery, thus checked, was put out of action in 8 minutes. Meanwhile the Infantry forded the Ai ho, which is nowhere more than 4½ feet deep. When within 1,300 yards of the Russian lines they were met by a murderous fire; but their own Artillery supported the advance throughout, keeping up a running fire against the Russian positions. At 8 a.m., Kuroki ordered a general assault, and the first line of Russian trenches was captured by 9 a.m., for a loss of only 600 men.

This victory gave immense prestige to to the Japanese army; and it was mainly due to the excellent way the guns first prepared, and then supported the attack.

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Without them, a position which appeared almost impregnable could never have been seized so rapidly.

While the action on the Yalu showed the actual power of guns, the fighting at Mo Tien Ling, showed the effect of their rapid fire.

On this occasion (17th July, 1904), a Russian battalion happened to advance in company column down the Li Sha Pu Tzu valley, within almost 300 yards of some Japanese Artillery. The latter promptly seized their opportunity, and the battalion lost 300 men in a few minutes. Later on in the same action, a Russian battery on the lookout above Kin Ka Ho Chi, on the West of Mo Tien Ling, caught sight of a few companies of Japanese infantry on Mount Shi Ko Rei, 3,500 yards to the North. The battery commander had been making good use of his time while waiting, and the enemy's position was swept clear in a twinkling.

Now for instances of surprise: At Yan Tze Ling, on July 30th., a Russian battery surprised the Artillery of the Japanese 2nd division coming into action 6,000 yards away; several of the gunners were killed and wounded, and the others had to run under cover. On October 12th., at Tu min Ling, on the Sha Ho, a Japanese battery, though watched by some Russian Artillery, opened fire with admirable promptitude on a Russian battalion which appeared suddenly within range. The battalion was scattered before the Russian guns had time to draw off the enemy's fire from them.

But we must not be misled by these instances into exaggerating the work of the Artillery; there were many others in which, for an immense expenditure of ammunition, only very indifferent results were obtained. The Japanese fuzes were frequently defective or badly set. At Liao Yang, on August 30th., numbers of shell fired against the Russian trenches and guns never burst at all; on the Sha Ho, on March 2nd 1905, several batteries firing at a Russian regiment standing out most conspicuously against the snow only inflicted a loss of 40 men, because all their shell burst too high. There was a great deal of that useless cannonading against trenches which does no serious injury, and which has so often been condemned. On the Sha Ho, for instance, certain Japanese batteries bombarded a zone of ground in which Russian batteries were supposed to be concealed, for four consecutive days, an hour and a half each day. The Russian guns, all the time, were somewhere else. Another case was reported from Liao Yang, of a Russian battery which searched a valley for Japanese Artillery, firing 70 rounds every five minutes during three hours, or roughly 2,500 projectiles; and there was not a soul in the place they were firing at!

From all these episodes we can draw a lesson which stands out from the whole campaign, — that Artillery must from the outset take up concealed positions, or else be destroyed. The Russians, as we saw, did not know how to use their new guns at first, and in may cases (notably the Yalu and Wa Fang Kou) they learnt to their cost the danger of being exposed. After the latter action, in fact, the Artillery on both sides only used indirect fire. At Liao Yang the guns were so well concealed that they had to grope about, so to speak, for one another. It need scarcely be added that this involved a huge expenditure of ammunition; with sixteen batteries the Russians fired 108,000 projectiles in two days, 30th and 31st August, or 420 rounds a day per gun.

This necessity to take up concealed positions involves consequences (1). technical and (2). tactical.

(1). All the preparatory movements, approaching and taking up positions, etc., must be made with extreme care. The least neglect may be fatal not only to one's own, but also to neighbouring batteries.

Teams and limbers can no longer be kept close up, but must be taken at least 400 yards to the rear under cover. This will in most cases necessitate carrying up ammunition by hand for some distance.

Guns must move about as little as possible, but they should move to new positions as soon as they have achieved a decisive result. With the long range they have at the present day, they need not be moved about as much as was formerly necessary.

(2). Formerly, guns fought in the open; and consequently, when a battery was attacked it was compelled to reply. Now, with facilities for concealment and indirect fire, it need no longer be so; very often it is more advantageous not to. Even in the open their shields enable guns to sustain attack without replying. During the battle on the Sha Ho, on October 12th., a Russian battery with no other protection but its shields and the trenches hastily constructed for the detachments, sustained for thirteen hours the fire of three Japanese batteries, which did not prevent it from taking advantage of a lull to disperse two infantry columns, and cannonade a fourth battery coming into action. The same thing occurred again the two following days. On the 14th., the same battery was exposed to oblique fire from Artillery and frontal fire at 1,400 yards from Japanese sharpshooters; yet during the whole day it lost only six men wounded and one killed while laying a gun. It should be added that the layer and handspike number, emboldened by the security of their protection, remained at their guns practically the whole time.

This power of abstention from replying is leading to various devices for what is called in French "allumage"—lighting up a fight by forcing the enemy's guns to take some action or other. The Japanese made use of dummy batteries and decoy batteries. They fixed up dummy batteries and fired puffs from them at Tu Min Ling, on the Sha Ho, and obtained the desired results. At Liao Yang and Ta Chi Chiao, they opened fire with batteries in the open, out of range of the enemy's guns. Lieut.-Colonel Pachtchenko's ac-

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count of the latter fight is very instructive. He tells us that two batteries of the group to which he belonged were posted to the W. of Yu Nan Tun, 600 yards behind the crest of a small hill some 80 feet high, which formed an excellent observing station. To the N.E. of the same village, and 700 yards to the rear and to the N. of another hill, were two more batteries from the 1st Brigade. The 1st battery of this Brigade was between this hill and a third one which formed the Commander-in-Chief's observing station. The three remaining batteries of these two Brigades, and two Cossack batteries, were, with characteristic Russian mismanagement, kept in reserve over three miles to the rear.

On the morning of July 14th., the Japanese opened fire with two batteries in the open. The Russian batteries received orders to fire at them, but they were found to be out of range; they were, in fact, decoy batteries, the object of which was to induce the enemy to reveal his positions. The result was that half an hour after the Russian guns had opened fire, thirteen Japanese batteries had come into action, two by two, within an arc of 60°. They failed however, to find the range to the Russian guns, and consequently did no damage to them. Towards 3 p.m., another battery of the 1st Brigade, which had been held in reserve, reinforced Pachtchenko's group; but its appraoch had been observed; it was fired at, suffered losses, and involved another battery which had hitherto escaped in the same fate. This Artillery fight lasted 15 hours, with no result to show on either side for a formidable expenditure of ammunition. Lieut.-Colonel Pachtchenko's battery created a record with 4,178 rounds, or 522 per gun.

From this we may learn how difficult it is to overpower guns that are concealed; to silence them so effectively that they cannot reopen the fight. It will be an extremely difficult task, requiring considerable time and a great expenditure of ammunition. Experience is on the side of those who hold that the Artillery struggle will last throughout the combat itself.

At a certain stage in the Artillery struggle, it will be possible to set aside certain batteries to watch those of the enemy's guns which have been overpowered. The remainder will be available to support the decisive infantry attack, and it is then that the co-operation between the two arms must be closest. Artillery, as Meunier says must keep its fingers on the pulse of the battle, watching every check and every onrush of the infantry, and acting in each case as the circumstances require; sometimes only following the infantry in front of it, sometimes rushing forward to fresh positions to keep in closer touch with it.

There was no instance in the Russo-Japanese war of batteries going right forward with the infantry. On both sides, but especially the Japanese, the Artillery showed a really remarkable spirit of co-operation and sense of duty. If they never ventured forward to the furthest points with their infantry, the reason probably was that they knew they would go to certain destruction without really benefiting the infantry in any way. Infantry, in the latter stages of its advance, can only move by short rushes; beneath the hail of bullets it is compelled to lie down, to burrow behind cover, sometimes to disappear for an appreciable length of time. What can a large and compact mass like a battery do in this pandemonium? Even its moral support would fail; the sight of gun teams plunging, rearing, and falling over one another would hardly be comforting to the infantry.

There will doubtless be occasional cases when a bold commander will be able to lead up his battery in support of the infantry to within ranges which are usually fatal to Artillery; but these cases are exceptional, and they can only be seized with that quick decision which springs from a perfect appreciation of situations. The essential point is that the Artillery should support the infantry with its fire up to the very moment of the decisive assault. The drill-book says it must cease firing when the infantry arrives within 5 or 600 yards of the enemy's lines; but that is the precise moment when its assistance is most required, for it is then that the enemy, hitherto hidden away in his trenches, has to expose himself in order to fire. Only the bursts must be watched most carefully, to make sure that one's own infantry is not hit. The incident on the Yalu, when two Japanese shell tore a deadly gap through a Japanese column rushing to the assault, showed the necessity for a system of signals by which the Artillery can be told the exact moment to lengthen their fire so as to hit the enemy reserves. As a further precaution the guns could return to percussion firing during the final stage of the assault; and it can be confined to batteries specially placed on the flanks, which can see the precise moment when their fire begins to be dangerous for their own infantry.

Before drawing final conclusions, we may say a word about the losses inflicted by Artillery. Many writers before the war foretold that those losses would be appalling; the statistics, on the other hand, attribute very little more to guns than to the bayonet, while the rifle, as usual, has the lion's share. The fire effect of Artillery is not, however, to be measured by the numbers of killed and wounded, though we might also find that a good deal of what is credited to rifle bullets was really due to shrapnel. This is quite unimportant. Artillery produces its effect in other ways. It is quite certain that the progress which has been made with the new guns has led to a diminution of the losses which they suffer, and, in the case of infantry, to new methods of advancing;—more slowly, fighting their way step by step, conforming to features of the ground by taking up less vulnerable formations, contenting themselves with the most tedious progress, and working by night as well as by day. More than this;

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if we compare various statistics of losses, we find that in battles in which the action was normal and regular, the losses suffered by the infantry varied according to the number of guns engaged and the way they were handled. Thus at the Yalu, it was owing to the excellent preparation of the attack by the Japanese Artillery, which was superior in number to the Russian, and to the excellent co-operation maintained between the two arms, that the losses of the infantry were so slight in spite of their dense formation. At Wa Fang Kou, the Japanese Artillery were equally brilliant. The numbers on both sides were almost the same, but the Japanese had 216 guns against 94 Russian; and the Russian losses more than doubled those of their adversaries,—3,500 as opposed to 1,200. At Liao Yang, where the numbers engaged, and the losses, were almost the same on both sides, we find the adversaries equally strong in Artillery, and using their guns in the same way.

Our conclusion is that the task of the Artillery consists not so much in inflicting losses upon the enemy as in paralysing his action, and in economising the lives of its own infantry. This is a noble enough task, and its fulfilment amply justifies the efforts which are being made by the Great Powers to renew their Artillery.

It is not true to say that Artillery has not come up to expectations; it would be more correct to say that some critics have not always appreciated its proper functions.

To sum up. From the technical point of view, the outstanding features of the new Artillery are its rapid and powerful action, and its power to act by surprise; in consequence, extreme care must be shown in approaching and taking up positions. Up to the moment when the decisive attack takes place, these positions should all be concealed; the methods and means of fire must be carefully thought out and adapted to circumstances; and though guns should often change from one spot to another close at hand, they should rarely be moved to entirely new positions.

From the tactical point of view, it seems to be clearly shown that Artillery must only fire at important and well defined objects; that the Artillery struggle lasts throughout the whole of an action; that as soon as the enemy's Artillery can be considered overcome the guns should immediately set themselves to prepare for the decisive attack of the infantry, and that the co-operation of the two arms in this attack should be as close as it can be made; finally, that the batteries so engaged should be handled with the utmost boldness consistent with avoiding certain destruction.

Apart from these lessons, there is a moral aspect of the war. One is struck by certain analogies between it and the South African war;—the inequality of size between the two contending powers, the assumption of the initiative by the smaller one, materiel of about the same value on both sides, etc. Why were the results so different? It was because the Boers never learnt the secret of organisation, whereas the Japanese saw years ago that if they were to keep the position they sought after, they must organise a strong army out of the whole manhood of the nation. In this respect they are an example to all those who love their own country.

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Revue Militaire des Armées Étrangères.

Précis of Contents.

By CAPTAIN F. A. BUZZARD, R.F.A.

June, 1907.

1. Combined "Pioneer" Operations in Germany.
2. The Grand manœuvres of the Chinese army in 1905 and 1906.
3. The new defences of Antwerp.
4. The military forces in England in 1907.
5. Foreign Military Notes.

July, 1907.

1. The reorganisation of the Japanese army.

Artillery:—

Two Horse Artillery batteries are to be formed this year. The Japanese army did not possess any Horse Artillery during the late war, except one improvised battery which was attached to Akiyama's Cavalry brigade. Eventually there will probably be 6 batteries organised in three brigades. The equipment is to be the same as that of the Field Artillery (new pattern).

It appears to have been decided to form two brigades of Heavy Field Artillery, each brigade to consist of two or three regiments and each regiment of 6 batteries of four guns.

Only one brigade, of two regiments, will be formed this year. One regiment will be armed with the 15 centimetre (6″) howitzer and the other with the 12 centimetre (4·8″) howitzer, both being weapons of "accelerated fire." The material is to be provided by Creusot. This firm has lately received an order for 40 howitzers of the former calibre, and 30 of the latter.

The Japanese are still experimenting with a 10·5 centimetre (4·2″) howitzer, which will, if adopted, presumably displace the 4·8″.

A New Field Gun:—

Early in 1905, during the war, Krupp's firm received from Japan an order for 400 Q.F. field guns of a pattern similar to that provided for Switzerland. The first consignment of these guns did not arrive until after peace had been made.

After the war the Japanese authorities devoted much attention to a new gun, which appears to have been very like that adopted by England. Negotiations were even opened with an English firm for the rearmament of the Artillery, but, whether it was thought unwise to adopt so heavy an equipment in view of the poor horses available in Japan, or whether there was a clause in the agreement with Krupp which reserved to that firm the right of providing all guns not made by the Japanese themselves, it seems certain that fresh orders for a Field Artillery equipment have been placed with Krupp.

Mountain Artillery:—

Before the war, seven divisions of the Japanese army were provided only with mountain guns.

The four divisions formed during the war were equipped with field guns.

After the war the mountain guns of four of the seven first mentioned divisions were replaced by field guns.

At present only the 9th, 11th and 7th divisions have mountain guns (the last mentioned having only one "group" of this nature).

It appears to be the intention to equip all the divisions with field guns.

The mountain batteries will be organised as two or three independent brigades, the units of which will, on mobilisation, be allotted to the armies according to the nature of the country in which each is expected to operate.

(Note by Translator. This re-arrangement of the Mountain Artillery is of some interest in view of suggestions which have been made, based upon the lessons of the late war, for the more extended use of mountain guns in non-mountainous country).

2. The Belgian Grand manœuvres of 1906.
3. The Military Forces of England in 1907 (continued).
4. Foreign Military Notes.

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The Heavy Artillery of the Field Army in France.

Translated from "Neue Militärische Blätter."

No. 16. APRIL 14th, 1907.

By CAPTAIN F. A. BUZZARD, R.F.A.

Monsieur Picquart, the French War Minister, in introducing his extraordinary Budget for 1907, mentioned, among the larger items of expenditure on new purposes, one requiring a grant of 74½ million Marks, which sum was passed by the Chamber and Senate. The sum in question was that allowed for the increase of Artillery material, and calls for particular attention as the corresponding sum under this head in 1906, only amounted to something over two millions.

The principle increase is caused by the introduction of the much discussed 15 cm. (6") Rimailho howitzer, which, after having been subjected to various trials, is now being manufactured and is in the future to form the main portion of the Heavy Artillery with the field army. It is apparently intended to construct 120 of these batteries and to allot 6 batteries to each of the 20 army corps.

The Budget Commission proposes that each battery of Heavy Artillery should consist of 2 guns.

The new weapon has a calibre of 155 millimetres, its length is small and it is made of steel. It has a hydro-pneumatic buffer, and is supported on the carriage by means of two horizontal trunnions. There are drag shoes to the wheels, and a spade at the end of the trail. In its outward appearance and power the new 155 Rimailho piece is practically a larger edition of the 75 mm. gun.

It has at the same time to be provided with a special arrangement on account of the nature of fire for which the Heavy Artillery is intended. If the trunnions of a gun are situated about the middle of the piece, the breech is bound to come very near the ground when the gun is very much elevated. But large angles of elevation are the rule with the piece in question, which is used as a howitzer, and, if the trunnions are centrally placed, the breech would strike the ground when the piece recoiled. In order to avoid this the trunnions are placed near the rear end of the howitzer, so that the weight pivots about a point close to the breech, the latter therefore remaining, at all angles of elevation, at about the same distance from the ground, viz. 1½ metres (4·92 feet). There is thus plenty of room for the recoil. In laying for elevation the layer has to bring the pointer of the indicating arm to the ordered graduation on a scale situated on an arc which is connected with the cradle.

In connection with the latter there is another scale which enables the original elevation to be kept on even if the howitzer moves somewhat on being fired. It will thus be seen that the elevating arrangement is separate from the carriage proper, so that the howitzer is povided with the "independent line of sight" in the same way as the 75 mm. gun. This device increases the accuracy and the rapidity of fire.

All the more important and more difficult calculations in connection with shooting have, according to the new regulations for Foot Artillery, to be worked out by the officers, particularly by the Brigade Commander. The latter has to personally determine the elevation and line to be given to the batteries, and is provided with two small theodolites for this purpose. These instruments are carried by the men told off for keeping up communication.

The most noteworthy point about this new equipment is its mobility. The howitzer itself is carried on one wagon, and the carriage on another, and it is said that these can keep up with the movements of the troops, being able to move at a trot on good roads. Limber included each vehicle weighs 2400 kilos (about 47 cwt.), a fact which is difficult to reconcile with the alleged weight of the howitzer in action, which is given as only 3200 kilos (62·7 cwt.). By means of a simple arrangement the howitzer slides quite easily on to the carriage, and the piece can be assembled in about two minutes.

Finally the increased rapidity of fire possible with the new equipment has been much talked of. Whereas the old 15 mm. "short" gun could only fire one round in two minutes, the new howitzer is said to be able to fire four or five rounds per minute. This is apparently brought about by the breech being opened automatically after each round.

The shell weighs 43 kilos (94 lb.), and contains 13 kilos (18½ lb.), of melinite. The gun wagon has 8 horses, the other two carriages 6 each. Each sub-section thus requires 20 draught horses, and each battery of four howitzers requires 100 horses, including "riders." It is intended to provide each howitzer with three ammunition wagons in war. What is to be the length of such a column on the line of march? And if one of the wagons of the divided piece gets left behind, what then?

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The New Field Artillery Regulations.

Précis from " Neue Militärische Blätter."

By CAPTAIN F. A. BUZZARD, R.F.A.

May, 19th and 26th 1907.

The introduction of Q.F. guns, the increased importance of firing from covered positions, and the necessity of adopting a system of fire discipline more in keeping with the requirements of modern warfare, have led to the issue of a new German Field Artillery Training which has recently received the Imperial sanction.

Introduction.

The training of brigades and larger units of Artillery is to be directed on broad lines with the object of obtaining intelligent co-operation. Co-operation with the other arms is more insisted upon than before. It is pointed out that, owing to the wagons having to be brought up to the guns immediately the latter come into action, and to the wagon bodies having to be placed alongside the guns, a large number of highly trained drivers and gunners is required, and batteries must, more often than formerly, be exercised at war strength, their requiements being made up by borrowing from other batteries.

Telephone and signalling flags are mentioned as indispensable for the communication of orders.

(1). Foot Drill.

A few minor alterations only.

(2). Standing Gun Drill.

3, 4 and 5 ride on the gun limber. In field batteries 5 numbers are told off to, and ride on, the wagon of the firing battery. In horse batteries there are three firing battery wagon numbers with a horse holder.

In action, 1 and 2 sit on the loading and laying seats, 3 and 4 kneel on the right, the gun captain on the left, all three close to the trail and making use of the cover of the shield. The wagon body is placed alongside the gun and about 20 inches from it. The ammunition taken out of the wagon limber is placed about 2 yards behind the trail. No. 5 and two wagon numbers kneel behind the wagon body. 3, 4 and 5 have fuze keys, instead of 4 and 5 only.

Besides laying over open sights (or through the telescope) three methods of laying are recognised, viz:—

(1). Laying in the "almost covered position," when the layer stands on the gun and lays over the elongated sight provided for this purpose (Richtfläche).

(2). The layer may stand on some elevated position behind the gun and lay by means of white mark on the shield and a sight fixed on the muzzle of the gun.

(3). Laying from a completely covered position. In this case the B.C. gives an angle to one gun and the others lay parallel by transference of angles.

In all these three cases the laying for elevation is by clinometer.

Stress is laid on the importance of mastering the difficulties of firing from behind cover and upon the intelligent carrying out of orders by section commanders. If exposed to very heavy fire the B.C. may order "Stop firing—Under cover," whereupon the detachments get as close up to the shields as possible.

The No. 1 must take particular care to select a good gun platform and, by means of digging, facilitate the carriage becoming steady as soon as a round has been fired. It is regarded as an important point that the space between the bottom of the shield and the ground should be banked up with earth at once to lessen the risk of losses.

Battery Drill and Manœuvre.

The battery consists of 6 guns, 6 ammunition wagons, and "light" and "heavy" baggage wagons. The 6 ammunition wagons form the "Staffel" and are as a rule under command of an officer.

The necessity of bringing both guns and wagon bodies into action as rapidly as possible is dwelt upon.

Battery column is done away with, at least in the case of field batteries. If it is desired to shorten the column on a road, the wagons are brought up on the flank of the guns (i.e. our column of subsections).

From column of route, line to the front is always formed on one flank of the head, not outwards.

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In the "wagon line," when under cover, the wagon limbers are placed 20 metres on one flank of the gun limbers, both lines in "column of route" (i.e. the whole in column of sub-sections at full interval).

If it is required to limber up the whole firing battery very rapidly, the word "change of position" is preceded by "wagon bodies to the rear," whereupon the latter are run back about three metres.

The instructions as to the occupation of and departure from positions distinguish clearly between positions in the open, "half covered positions" and "completely covered positions," and also between the approach under cover, and the exposed approach.

As with us and with the French, a "Position of readiness" (Bereitstellung) and a "position of observation" (Lauerstellung) are recognised.

"Drill" in brigade is no longer to be carried out. The brigade commander controls his batteries by issuing orders as required.

A brigade in column of sections is not a formation recognised by the new book.

Employment of Artillery in action.

Combined practice with the other arms, night practice, and entrenching are mentioned as requiring special attention.

The principle, which has long held good in Germany, of endeavouring to bring into action at the earliest possible moment, a large mass of guns, has been somewhat modified. It is considered that the bulk of the Artillery should as soon as possible be brought on the field of battle and be ready for immediate employment; but that this Artillery should not be actually committed to action until the tactical situation has been cleared up to a sufficient extent, or it is apparent that a decisive action is imminent.

Bursts of fire, rather than continuous fire, are looked upon as likely to give the best results, the support of the infantry being always the point to be kept in view.

The dispersion of units of Artillery is recommended as likely to diminish the effect of the enemy's fire and to enhance one's own by enabling it to be oblique.

Cover.

The degree of cover which should be sought for by Artillery in action is mainly dependent upon the object in view.

During the decisive stages of the infantry fight, the Field Artillery will almost have to renounce the many advantages of completely covered positions and fire from "half covered" or uncovered positions. Of these two natures of positions, the former is to be preferred.

Artillery commanders, including battery commanders, are empowered, in face of overwhelming hostile fire, to order a temporary cessation of fire.

Fire should be kept up until shortly before the attacking infantry enters the hostile position, and Artillery officers should be sent on with the firing line to signal or telephone back when it is no longer safe to keep up the fire on the hostile position.

A point which is of considerable importance for Artillery and Staff Officers to remember is that, when Artillery in a column marching along a road is ordered to push on in order to deploy for action, its leader must be told whether he should pass the infantry column in front of him on its right or left. This will of course depend upon whether the guns will have to leave the road on the right or left. Neglect of this precaution may delay the infantry whilst the whole of the Artillery is crossing the road in front of it or cutting through the infantry column.

A "light" ammunition column of 21 ammunition wagons has recently been allotted to each brigade of Artillery instead of to each Artillery regiment, as formerly.

Communication between wagon lines, firing batteries, and light ammunition columns is to be kept up by flag signalling.

As regards the replenishment of ammunition, it is recommended that horsed wagons should be brought as close to the guns as possible. Failing this, wagon bodies may be run forward by hand, or baskets of ammunition may be carried forward by individual men.

Before leaving the firing line after bringing the guns into action, gun limbers are emptied wholly or partially.

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Revue de l'Armée Belge.

Précis of Contents.

By LIEUTENANT K. B. FERGUSON, R.G.A.

March—April, 1907.

1. "Q.F. guns in the Russo-Japanese war."

An abridged translation of this article is given elsewhere. It is a lecture delivered at Antwerp by Major C. de Castres de Tersac, who bases it mainly on Meunier's book on the war. The lecturer quotes a French writer of many years ago, who said: "The most humble detail noted on the spot in action is more instructive for a soldier than all the Thiers and Jominis; they speak, no doubt, for the chiefs of armies, but never show what one wants to see,—a battalion, a company, a squadron in action." And he keeps this idea before him in tracing out various incidents of the great war.

2. "The Defence of Belgium,"—Concluded.

This concluding article deals with suggestions for the best organisation possible for the defence of Belgium, and with the engineering and other works which are held necessary to perfect that defence.

3. "Gun carriages with long recoil"; their construction, mechanical theory, and efficiency.—Continued.

Capt. A Collon, continues his learned treatise on this subject; but it is to be feared that most readers, who find higher mathematics bad enough to go back to in their own language, will find the subject still more forbidding when X^1 is raised to the power of $\frac{5}{2}$ in a succession of unfamiliar technical expressions from Belgian schools.

4. "A Study in Musketry."—Continued. By Capt. Bisman.

As was pointed out in our last précis, this series of articles is designed to work out the relative fire effect to be expected in the field against troops in various formations, and at various ranges.

5. "Cavalry Musketry Regulations." By "O. Dax."

The author has been attacked for his own attack on the above Regulations, and he now writes a bright little article to defend himself. He is apparently of opinion that the Musketry Regulations of the Belgian Cavalry requires a degree of technical knowledge of musketry on the part of the Cavalry officer which he can only acquire at the expense of other branches of knowledge which are more essential for his arm.

6. "The General Manœuvres of 1906." Concluded.

7. "The Committee of the 2nd Line of Defence of Antwerp."—Continued.

An account of the proceedings of this Committee, which has been appointed by the Belgian Government to investigate and advise upon the best positions, etc., for the 2nd Line of Defence which it has been decided to establish.

8. Current events, Notices of books, etc.

Streffleur's Militärische Zeitschrift,

WITH WHICH IS INCORPORATED

Organ der Militärwissenschaftlichen Vereine.

Précis of Contents.

By LIEUTENANT C. O. C. HUNT, R.F.A.

March, 1907, Vol.I.

The 18th of August, 1870.
The Infantry attack over open ground.
Infantry cyclists.
Infantry clothing and equipment.
Field Artillery Training, 1906 (Translated).
Progress of foreign armies, 1906.
Russia is thoroughly reorganising the army. Four heavy batteries to be converted into light.
Foreign Military Intelligence. Nothing of special interest.
Naval news.

May, 1907, Vol. I.

The Campaign of Isaszeg 1849. (Continued).
The share of the infantry in fire technique.
The influence of mechanical transport on the train of an army.
River gun boats.
Progress of foreign armies, 1906. Nothing of special interest.
Naval News.
Technical notes.

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"Les Spectateur Militaire."

Précis of Contents.

By MAJOR E. P. SMITH, R.F.A.

1st February, 1907.

Cavalry in the Russo-Japanese war and in the future. By General Pedoya.

The defence of crests against infantry firing the German cartridge S. General remarks.

Determination of the distance from which the fire of the assailant is tangent to the ground behind the crest. General LeJoindre.

Defence of the Colonies.

Sea defence. Naval forces at a distance. The bases of the fleet. Capt. Ferradini.

Whites *versus* Blacks.

The situation in the interior. The probable attack. The solution of the problem. R. Castex.

Solution of a tactical problem given at the entrance examination at the Higher Military school.

15th February, 1907.

Cavalry in the Russo-Japanese war and in the future.

Raids. Reconnaissances. (To be continued). By General Pédoya.

Defence of crests against infantry firing the German cartridge S.

Applications of the theory. Variable slopes behind the crest. Positions to be occupied by the chain of the defence. Formations to be taken up by the reserve. Intervention of the Artillery of the attack. Conclusions. By General LeJoindre.

Essay on Colonial Defence.

Chapter V. The land defence. General plan of defence. Places and posts. (To be continued). By Capt. Ferradini.

Yellows *versus* Whites.

Part 2nd. The defence on land. The defence of Cochin-China. (To be continued). By R. Castex, Ship Ensign.

1st March, 1907.

Cavalry in the Russo-Japanese war and in the future.

Information to be gained from former wars. The time for great Cavalry charges has passed away. Dismounted action for Cavalry has become more frequent. (To be continued). By General Pédoya.

Essay on Colonial Defence.

Chapter VI. The Colonial army. Native troops. Reliefs. The army of occupation. The command of the Colonial army. Transports. (To be continued). By Capt. Ferradini.

Yellows *versus* Whites.

Defence of Tonkin. Different questions. (To be continued). By R. Castex, Ship Ensign.

Review of books.

Memoirs of General Beningsen. Study of Infantry Tactics. The two Sieges of Port Arthur. The two years Law and the Lesson of the Franco-German conflict as regards Morocco. On the Horse.

15th March, 1907.

The grand Autumn manœuvres in 1906. General critical study.

Preliminary note. Introduction. 1st Chapter.—Generalities. Details. Preface.

Cavalry in the Russo-Japanese war and in the future.

Great masses of Cavalry, massed under one command, are more troublesome than useful.

Essay on Colonial Defence.

Chapter VII. The Governor.

Whites *versus* Yellows.

Part III. Maritine Defence.

1st April, 1907.

The grand Autumn manœuvres of 1906. General critical study.

Chapter II. Manœuvres of the 2nd Corps reinforced.

1. Programme and topographical description.
2. Preliminary observations.
3. Sketch of the manœuvres.
4. General theme and execution.
5. Observations.

Cavalry in the Russo-Japanese war and in the future. (Conclusion).

Essay on the defence of the Colonies.

Chapter VIII. Conclusion. Tables and Statistics.

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Review of books.
General considerations on -Army Organisation. Tactical tendencies of our Cavalry. Recruiting dictionary.

15th April, 1907.

Grand Autumn Manœuvres of 1906.
Chapter III. Cavalry manœuvres.—Topographical description. Preliminary observation. Further observations. A general tactical study of Cavalry. (To be continued). By General L.
The Swiss Army.
Cavalry. Some ideas on the handling of mixed detachments, in particular situations which may have to be dealt with by Swiss Cavalry.
Preface.
I. Introduction and statement of the problems.
II. General remarks.—Necessity of bearing in mind the special situation of Switzerland. The command.
III. The fundamental tactical question. Mobility; should co-operation be effected by the concentration of all the forces at the same point, or by converging movements? (To be continued).
Method of instruction in field service for squadrons.
Preliminary considerations.
Chapter I. The Cavalryman's education. Marching. Seeing. Reporting.
Chapter II. Group instruction.—Posts. Outpost patrols. Formation of vanguards. Flank patrols. Formation of rear-guard. Reconnaissances. Reconnoitring patrols. Corresponding posts. Ground scouts.
Chapter III. Instruction in troop and squadron movements. By Lt.-Col. V. D'Urbal, 14th Dragoons.
Yellows *versus* Whites.
Part IV. The final offensive phase. (Conclusions). By R. Castex, Ship Ensign.

1st May, 1907.

The grand Autumn Manœuvres in 1906.
General critical study. Chapter IV. Fortress manœuvres at Langres in 1906.
1. Manœuvre orders.
2. Manœuvre scheme.
3. Investment and siege of Langres.
4. Discussion of the operation.
5. The investment.
6. Observations on the investment and résumé of the operations.
7. The siege.
8. Observations on the siege and general résumé of the operations.
9. Heavy Artillery and R. 155 gun.
10. Critical study or fortress manœuvres.
Observations. By General L. To be continued.
Swiss Army. Cavalry.
Some ideas on the conduct of mixed detachments, in special situations, in which Swiss Cavalry may find itself.
IV. Independent groups charged with a special mission.
(a). Exploration.
(b). Special cases. March against lines of obstacles.
(c). Pursuit.
(d). Other special missions. Capture of points or positions occupied by the enemy.
(e). Other special missions. Protection of the flanks.
Retreat. Guerilla warfare. By Lt.-Col. J. Yeerleder.
Method of instruction in field service.
Instruction of officers in the regiment.
Preliminary considerations.
General remarks. By Lt.-Col. V. d'Urbal, 14th Dragoons. (To be continued).
Exercises in Field Service for Officers
Critique by the Director. Narrative of the operations by the commanders of sides. Examples of exercises in field service for officers. Reconnaissance of ground. Subject of the exercise. Subjects taken in the practice of guerilla warfare. Good troops should be used on both sides. Defence of convoys and other matters connected with supplies of rations.
Requisitions and their protection.
Protection of a frontier. Defence of roads metalled and connected by telegraph. Study of guerilla warfare. Perfecting Leaders in the command of troops. Perfection of the tactical intelligence of officers. (To be continued).

1st June, 1907.

The Grand Autumn Manœuvres in 1906.
General critical study.
General résumé.
Heavy Artillery. Is it really essential to a field army? Divergence of opinion among military authorities. The moral effect is greater than that of field guns.
In 1870 our Heavy Artillery, little of it as there was, did good work.
The army of Coulriners, armed with some heavy guns, achieved for us a solitary success.
Our ideas about the use of Heavy Artillery in the Russo-Japanese war are, as yet, somewhat confused.
Germany having something like 396 field mortars, we must have an equivalent.
The Rimailho Gun and Heavy Artillery.
Commandant Rimailho, has adapted a siege gun for use in the field.
To facilitate transport, the gun is separated from the carriage. Weight of shell 88 ℔.
Account of experiment carried out with the Rimailho gun and Heavy Artillery.
Arguments against use of Heavy Artillery in the field (difficulty of ammunition supply &c.).
General consensus of opinion in France against it.
In Germany on the contrary, there is a strong feeling in favour of it.
General criticism of fortress manœuvres.
Umpiring and rules at Manœuvres. By General Cramer.
Exercises in Field training for Officers.
Translated from the German. By Gen. Litzmann.

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An International Garrison.
Chapter I. Canea.
Review of Books.
German South-West Africa. By H. Patte, General Staff.
Infantry, Artillery, and Cavalry regulations. By Lt.-Col. H. Martin.
German Infantry Regulations.
Study of Spanish Wars. By Comdt. Bagés.
Regimental Mutual Help Society. By Capt. and Adjt. Favier.
Position of re-engaged under-officers. By V. Lavand.
Account of conferences on the Russo-Japanese war.
The Egyptian Expedition of 1798-1801.
Illustrated annual of the Colonial Army. By Ned Noll.
Study of the Revolutionary Army. By Pierre Cantal.
Essay on Advanced Guards. By Capt. Gouche.
Machine-guns. By Lt. and Adjt. Noel.
The Conferences at The Hague. By General Pedoya.

15th June, 1907.

The Grand Autumn Manœuvres in 1906.
Chap. V. Naval Manœuvres in 1906.
1. Introduction. Tsushima.
2. Preliminary observations.
3. The navy, the ships, the "points d'appui."
4. Glance at the Manœuvres.
5. Observations on the Manœuvres.
6. General Conclusions.
7. Foreign manœuvres (German and English). By General L.
Exercises in field service for officers.
Preparation and direction.
Criticism by the Director.
Narratives by the Commanders of sides. By General Litzmann, Berlin.
The Channel Tunnel. Its influences on the safety of France and Great Britain. By G. Viernot, P.S.C.
An International garrison.
Chap. I. Crete.
Chap. II. The Calient Fanbourg.
Chap. III. Halépa.
By Iani Tikalis.

1st July, 1907.

The Grand Autumn Manœuvres of 1906.
General critical study.
Concise description of the naval manœuvres. By General L.
Exercises in field service for officers. Preparation and direction. Criticism by the Director. Narratives by Commanders of sides.
An International garrison.
Chap. IV. International Corps of occupation. Mission of the Corps of occupation.
The Cretan gendarmerie.
The Italians.
By Iani Tikalis.

15th July, 1906.

The Grand Autumn Manœuvres in 1906. General critical study.
Foreign naval manœuvres. Germany. England.
Chap. VI. Manœuvres of the German Army, 1906. Observations. By General L.
Exercises in field service for officers. Preparation of the Director in Chief. The Director's rôle during the exercise. Flagged manœuvres. Course of the exercise. Reports sent to the Director during the exercise.
The Director's position.
The Director's action on the progress of the fight.
His decision on the result of the attack.
Considerations on the Umpiring.
The fight must end in a likely manner.
Interruption resulting from atmospheric conditions. Fog. Application of the present example. Intervention of the Director.
Criticism of the exercise by the Director. Observations. The orders to the detachment. Written narrative by the Commanders.
An International garrison.
The Russians.
The English.
By Iani Tikalis.
The Channel Tunnel.
Chap. II. The submarine tunnel. Historical. Its characteristics from a military point of view. By G. Viernot.

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"Artilleristische Monatshefte."

Précis of Contents.

Also Précis and short notice,

By LIEUTENANT T. G. ANDERSON, R.F.A.

May, 1907.

XXI. The new German Field Artillery Training. (Roskoten). Precis.
XXII. The Theory of Recoil. (F. Rausenberger).
XXIII. The accompaniment of the Infantry attack by guns. (Richter). Short notice.
XXIV. The overdoing of cover. (Hanschild).
XXV. Trials before committee of the 7·5 cm. Krupp. Q.F. (Rohne).
XXVI. Garrison Artillery notes. No. 1. (The 28 cm. Japanese howitzer). (Berger).
XXVII. A Krupp fuze with direct and delay action.

The New German Field Artillery Training.

By ROSKOTEN.

The rearmament of the German Field Artillery with the recoiling gun is just completed and the new gun combined with the experiences of the Russo-Japanese war has had considerable effect on drill and manœuvres.

The new book lays stress on the following points:—

1. Full use of the Q.F. properties of the new gun.
2. The influence of the cover supplied by the shield and wagon and the general tendency to seek cover and decrease casualties.
3. A striving after simplicity in drill and manœuvres.
4. The closest possible co-operation with infantry.

Gun Drill:—

There are two new methods of fire.—"Group fire" where guns are fired when ready at different ranges ordered by the B.C., "Rapid fire" where each gun is fired when ready without waiting for a fresh range.

The great importance of strict fire discipline is repeatedly referred to.

Not only does the shield supply cover but the armoured wagon-body is placed ½ a pace to the side of the gun and so protects the ammunition numbers. This cover is always to be supplemented by earthworks.—No one is to stand except when the service of the gun requires it.—on the order "Take cover," all the detachment crouch close up to the shield or wagon.—The B.C. is authorised to temporarily stop fire if exposed to an overwhelming hostile fire.—Covered positions are more frequently recommended and the book says "The difficulties connected with covered positions are outweighed by substantial advantages.

Drill and Manœuvre:—

This is affected by the fact that in action the wagon-body must always be placed beside each gun. The fighting battery is a complete unit and consists of 6 guns and 6 wagons (which always follow their guns).

The only formations are:—"Column of Route" which is best adapted for taking advantage of the cover of the ground and is used both in the field and on the road.—"Line full interval" always used in the field.—"Line close interval" only used for "parking" or parade movements.—The old "Battery column" is only for Horse Artillery.—The depth of the line of march can be decreased by bringing up the wagons beside the guns (Double column).

Quick change of front by wheeling and deploying in any direction is most important.—Deployment now is much simplified and is only done to a flank.

Limbering, unlimbering and placing guns and wagons in action has become more difficult.—At "Action front," the wagons when the gun limbers have made room follow round behind the guns to a flank and halt with the axletree of the

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body 1½ paces (with howitzers 2½ paces) outside the right gun-wheel; are unlimbered and the body shoved round beside the gun.—In limbering up the body has again to be shoved back and as a rule limbered up to the rear.—"Action rear" is similar.—At "Action right" or "Left" the wagons may be brought up "double column" on the side of the guns away from the enemy.—The further procedure is as described.—Changes from the usual procedure necessitated by "terrain" &c., are left to the discretion of the B.C. and Captain.

The Choice of a Position:—

The book considers position under the 3 following headings and gives examples of a method of laying with each and some similar examples for howitzers.

(i). "Open positions." Where the guns are not hidden and the target can be seen over the open sights.

If the target is indistinct, the elevation is by clinometer. The first direction is on to the target and afterwards on aiming posts.

(ii). "Partially covered positions." Where the guns are hidden from sight but direction can be given by standing either on or beside each gun.

Elevation given by clinometer. The first direction obtained by the high dial sight and afterwards on to aiming posts.

(iii). "Covered positions." Where the battery is so far under cover that direction cannot be given from the gun positions.

Elevation given by clinometer. The first direction by director and afterwards on to aiming posts.

The respective advantages of these positions are:—"Open" and "partially covered" positions allow of rapid change of target and of taking on moving targets.—"Covered" positions deceive the enemy as to strength and locality and make the supply of ammunition and the change of position simpler. They sometimes also favour the delivery of surprise attacks.

The new book considers that covered positions should be taken up more frequently, both in attack and defence, but points out that they only give good results after careful preparation and with good observing stations, and that one must always be ready to leave cover if required to take on moving targets &c., and that this must be considered in deciding how far behind cover to go. The old maxim "usefulness before cover" still holds good.

Coming into and leaving a Position:—

The nature of the position and the methods of unlimbering and coming into action are left to the B.C. and will depend on the nature of the ground.

Guns will often be unlimbered under cover and run up into "open" or "partially covered" positions, both on account of the difficulty of placing wagons and to prevent dust giving away the position at once. In taking up "partially covered" positions labour is saved by coming into action right or left.

Advancing, coming into, and leaving, action unseen are as imporant as occupying covered positions.

Unless haste is ordered positions should be occupied unseen.

Positions should where possible be left by running back first the wagon bodies and then the guns.

The "position of observation" is new; it is taken up when the commander does not want to open fire at once; the guns come into action well under cover and are given the general direction of the target or allotted fire zone.

The book also mentions a limbered up "position of readiness" the distance of which from the proposed position depends on the lie of the land.

Preparation for Coming into Action:—

Entrenchment is most important especially in the attack, but works lose most of their value if they give away the position.

Modern weapons make the movement of troops by night necessary, as shown by the Russo-Japanese war.—This should be practised with the use of sign-posts, lamps, signals, &c.

The best information especially as to visibility and passibility is required to be able to take the fullest advantage of cover. The requisite time must be allowed for obtaining this (by patrols with the Cavalry scouts, &c.), but it must be obtained without giving the enemy a clue to the intended positions.

Every battery should have a larger number of outriders and should practice scouting, &c., in peace time.

Artillery, Cavalry, and Infantry leaders, must share mutually any important information they get from their scouts, &c.

Transmitting orders by means of orderlies, cyclists, telephones, flags, and in exceptional cases under fire by runners and connecting files, must be practised.

The Artillery division is no longer to be commanded by word of mouth but by written or signalled orders.

The Handling of large bodies of Artillery:—

The following are some new points:—

The C.R.A's., chief responsibility is always to have Artillery ready to throw in where the result of the fighting is undecided. He must give clear orders, placing his troops with due regard to the requirements of the fight and of the ground. He must keep up communication between himself and units. He may on occasions detail a portion of the Artillery as reserve.

The new book contradicts the old idea that the whole of the Artillery should support the infantry attack with an overwhelming fire. The shield and covered position have made Artillery so impervious that a concentration of fire does not bring quick success. It is therefore better not to open with all the Artillery thus letting the enemy know one's strength, but to detail a portion of the Artillery to support the infantry attack and to keep the rest in hand.

The chief advantages of the Q.F. gun,

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is the power of being able to seize "fleeting" opportunities.—A portion of the Artillery should be kept ready for them.—Each commander down to the B.C. is allowed great independence within his allotted fire zone, to enable him to seize opportunities which he would miss if he had to wait for orders.—When he does so he must always report.

The object of the C.R.A., is to concentrate fire on the right place at the critical moment. This depends on his judgment and good observation. Surprise fire, flanking fire, seaching fire, and good distribution are all important in obtaining effect.

Instead of concentrating masses of Artillery they will be kept in position of readiness and must not be sent into action till full information justifies it. Placing Artillery in groups is preferable to a long connected line.

Movements by "divisions" is the rule, but circumstances may require the detachment of single batteries, sections or even guns.

Artillery not in action must be ready to go wherever required at a moment's notice.

The commencement of a battle no longer consists of the two distinct phases, the artillery duel, and the infantry advance, these are simultaneous.

Artillery with Infantry:—

The chief duty of the Artillery is the most thorough support of the infantry.

Shooting over friendly troops is not attended with risk to them. If infantry have to pass through guns, fire can be taken up when they arrive 300 yards to the front. Fire can be kept up on the hostile infantry until the friendly infantry is within 300 yards of them. It should then be directed on the ground behind the enemy. An officer with the firing line will communicate by telephone or signal how far from the enemy the infantry is.

The question of thorough support of the infantry decides, what target to take on (the enemy's guns or infantry), whether to take cover or not and if so how much, the choice of position and method of fire.

Batteries accompany the infantry attack up to the shortest ranges and go with the infantry even by night if they are being moved towards a hostile position.

Any change of position (Artillery) must be carried out at such a time as not to leave the infantry without support at the critical moment.

Artillery in Attack, &c., &c.

Attack. The Artillery of the advance guard can by using covered positions keep the enemy in ignorance of its strength and purpose.

Although as shown it is usual to only detail a portion of the Artillery to support the attack circumstances may arise which require all the Artillery of an attacking force to be thrown into the action at once.

Howitzers should co-operate in the attack.

Defence. The choice of Artillery positions is most important and affects the choice of the main position. The infantry line should be 600 yards in front of the guns. This prevents the guns ever coming under effective infantry fire and prevents the infantry suffering by fire aimed at the guns.

Group formation, flanking works, and covering dead ground by means of parties of infantry supplied with plenty of ammunition are all important.

Covered positions are recommended on the understanding that they must be immediately left to take on the advancing infantry, &c., if necessary.

All available time must be used in scouting, patroling, observing (balloons), arranging communications (telephones), making earthworks, clearing the field of view, &c.

Pursuit. It is strongly emphasised that its object is the annihilation of the enemy. Artillery adapts itself to pursuit by combining power and mobility. It must be used to the fullest extent.

Retreat. Here Artillery is all important. It alone can check the pursuing enemy enough to enable the retreating infantry to reform. To this end it must not shrink from even risking the loss of its guns.

Horse Artillery with Cavalry:—

A new point which is emphasised is that when Cavalry is supported by Horse Artillery, it can check hostile columns and force them to a partial deployment and in the event of finding them too strong its mobility enables it to withdraw and try again elsewhere.

Ammunition Supply and Replenishment:—

The fact that the Q.F. gun has made ammunition supply more important than ever, shows itself in all countries.

In France there is the 4-gun battery with 3 wagons to each gun, besides 2 G.S. wagons. This gives 312 rounds per gun with the battery.

With us in Germany there is the 6-gun battery with 6 wagons and 4 G.S. wagons.

The next source of ammunition is the light "divisional" ammunition column which is as mobile as a battery and so can keep up in the field. After that comes the Artillery ammunition column of the Army Corps.

To increase the supply of ammunition in action, the wagon limbers are always, and the gun limbers usually emptied, and this ammunition is placed beside the guns. (This means about 100 rounds per gun) the gun and wagon limbers then go back and assemble about 300 yards in rear of the battery.

The duties of the officer with the limbers are, to arrange signalling communication with the battery, to improve the way to the battery if necessary, to fill up the gun limbers, to replace casualties in men, horses, &c., to supervise the requirements at the battery by means of a coverer left in the firing line, to place look outs towards exposed flanks.

The light ammunition columns (which as a rule march behind the infantry) take

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up positions in the field about 600 yards behind the units they supply. They immediately get communication with their batteries and with other ammunition columns.

For the replenishment of ammunition no hard and fast rules are laid down but the new book gives several examples.

Fresh wagons should be driven up as close to the guns as the cover and hostile fire will allow, use being made of lulls in their firing. If it is impossible to come close up the wagons can (where the ground is good and the distance short) be unlimbered and the bodies pushed up under their own cover. If this too is impossible the ammunition is taken out and carried up to the guns in the basket carriers.

On occasions wagons must not shrink from driving right up to the gun position under the heaviest fire straight from the divisional or Army Corps ammunition column.

The Accompaniment of the Infantry Attack by Guns.

By RICHTER.

The author considers this duty is especially important since the introduction of long range guns permits the support of the infantry attack from a distance also.

The German "Field Artillery Training," 1899 and "Infantry Regulations," 1906, both recommend that guns should accompany the infantry attack up to short range.

The Russo-Japanese war gives no good examples of this, but that does not prove it to be unnecessary.

The French advocate it very strongly, and recommend the guns taking up a series of positions on the flanks as from here fire can be kept up for longest, and counter attacks better dealt with.

It has been suggested that machine-guns only should accompany the infantry; the soundness of this cannot be admitted. Machine-guns do not give the moral support that field-guns give, nor the practical support of drawing the hostile fire from the first shot.

The advance of a battery at short ranges must be under cover.—It is impossible over the open or even where the movements of the guns are given away by dust. —Yet the importance of having even a section up with the infantry cannot be over estimated.

The question then is how can this important duty of the Artillery be made less difficult?

Motors seem the best solution.

There is already a motor which will carry 59 cwt. across country at a rapid pace, and even go up hills of 6° slope.

Taking the weight of the gun and detachment at 43 cwt., and that of the motor and shield at 16 cwt., a motor limber of this power would answer the purpose well.

If each Artillery brigade had 12 such motor limbers for the use of Artillery ordered to accompany the infantry attack, it would enable this to be carried out more thoroughly and with less loss.

June, 1907.

XXVIII. "The French Artillery discussion"; by Rohne.

The writer disputes the views of Gen. Langlois, and says that he (Langlois) has exaggerated ideas as to the great superiority of the Q.F. The pros and cons of the 6 and 4-gun battery are gone into.

XXIX. "The supply of the Field Artillery with ammunition in action"; by Richter.

Certain mechanical devices are described for keeping the guns supplied with ammunition whilst in action. Cars and limbers pulled up to the firing line by ropes and pulleys; motor limbers, &c.

XXX. The French 24-cm coast defence gun and light semi-automatic naval guns."

Describing recent improvements to increase the rate of fire of the 24-cm gun. The breech opening automatically after firing, and the recoil being used to raise a fresh round to the loading position. Photos and figures given with the descriptions of the mechanical devices.

Description of the 5, 7, and 7·5 cm., semi-automatic naval guns, with photos and figures.

XXXI. "The Austrial 8 cm. field gun." (Short notice combined with XXXII.)

General description of gears, sights, ammunition, limbers, &c. It is the only modern field gun with a bronze barrel and the writer doubts whether this will be found to wear as well as steel. Table of measurements, weights, &c., compared with the German and Dutch (Krupp 7·5 cm.), field guns.

XXXII. "The Dutch field gun." (7·5 cm. Krupp). By Rohne.

General description of gun, carriage, ammunition, &c., detachment required, ammunition supply. Organisation of the Dutch Artillery, and of a division and Battery. Tables showing the results of experimental practices carried out with 6 and 4-gun batteries, and with percussion and time shrapnel against shielded guns.

XXXIII. "A Flat Trajectory Gun for the Heavy Artillery of the Field Army."

The author refers to a discussion; "Heavy Artillery *v.* Field Howitzers,"

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and points out that the type of Artillery armament required depends on the designs of a nation, and thus nations like the Swiss and the Dutch which would expect to be immediatly on the defensive would only require medium Howitzers, whereas other nations would require both Heavy and light. The attack requires Heavy Artillery to overcome the heavy cover which the defence always affords. The author points out that a flat trajectory heavy gun (which at extreme range has an elevation of 30°) can by reducing the charge be made to act as a howitzer. Experiments in Germany on these lines had been carried out but in an unsatisfactory way with existing guns and converted matériel. The U.S. America had just successfully completed similar experiments and produced a gun of this type with a bore of 96·5 mm., and a shell which weighed twice as much as the American Field Artillery shell.

A table comparing the weights, measurements, &c., of a German, British, and Russian heavy gun (about 10 cm.) is given.

XXXIV. "The New English Mountain Gun." By von "Neuschler."

A short description of the organisation of the British Mountain Artillery. A description with figures of the gun, carriage, ammunition, method of carrying both with mules and carriers. The range table. The author ends by saying that the gun seems in everyway a thoroughly practical one though it has not yet had a service trial. That Germany might take a lesson from the English in the prompt and practical way they carry out the equipping of their army.

XXXV. "Garrison Artillery Notes." By Berger.

"The failure of the Japanese Siege Artillery at Port Arthur."

The author points out that the duty of Siege Artillery is to break down obstacles and prepare the way for the infantry. And so the subsequent loss sustained by the infantry is a criterion of how the Siege Artillery has done its work.

He points out that the Japanese failure was due to:—

i. Bad interior organisation.
ii. Poor commanding.
iii. Insufficient number of guns.
iv. Guns not being heavy enough.

General.

1. "Artillery Reminiscences." Comparing modern Artillery methods, rate of fire, &c., with those of the early 18th century.

2. A table showing the increase in calibre and length, of ships guns in the navies of the chief powers in recent years.

"Vierteljahrshefte für Truppenführung und Heereskunde."

Précis of Contents.

By LIEUTENANT W. E. IRONSIDE, R.H.A.

Port III., 1907.

1. "The campaign of Friedland"; by General Graf Schlieffen. (Strategical study).

2. "Review of the Native Question in the English Colonies"; by Major v. Heydebreck.

A description of the special conditions prevailing in India and Egypt. The balance of power between Hindus and Mahomedans. The use made of this by English statesmen.

The labour question in African Colonies. Reason for importing Chinese. Comparison of Boer compulsion method and British non-interference method. Failure of self-ruling Negro states. Ethiopian Mission.

3. "Training and War"; by General Freiherr v. Falkenhausen. A commentary on the 1906, Infantry Training Regulatios.

4. "Money and the waging of war"; by Hamptmann Ludwig, General Staff. An account of financial conditions during war. (Conclusion).

5. "Studies after Clausewitz"; new series, (continued). The autumn campaign of 1813, Leipzig; by Col. Freiherr von Freytag-Loringhoven.

6. "The engagements of the German troops in South-West Africa. (Conclusion). The war against the Hottentots:—

a. The engagements with Simon Kopper and the subjugation of Cornelius.

b. Hartebeestmund.

c. The operations against the Bondelzwarts up to the expulsion of Morenga.

d. The subjugation of Morenga.

e. Conclusion. List of troops engaged. Table of casualties.

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"Journal des Sciences Militaires."

Précis of Contents.

By LIEUTENANT C. O. C. HUNT, R.F.A.

May, 1907.

The Eastern Question.

Its origin, development, and its present state. The Anglo-Russian rivalry up to the crisis of 1876-78.—The treaty of Berlin. 1878-1907, internal crises, Anglo-German rivalries—Roumelia, Armenia, Crete, and the Turko-Hellenic war—Macedonia. With map. By Lieut. R. Boizard.

Looking back. A retrospect of men and matters, and studies in military history during the XVIII century.

The Staff, and its formation and composition. L. Hennet.

Recruiting and Mobilization.

Soldiers of the Revolution.

A study in practical military sociology.

The Republican army refuses to mix in politics.

Enthusiasm and dignity.—Revolutionary songs, 1794-1815. (To be continued). Lieut. J. Diez.

Soult's army in Portugal in 1809.

Its composition.—Events in the campaign.—The army of Portugal. Lieut. Hedde.

Military notes of the month.

Disbandment of the 4th battalions.

Field Artillery with Q.F. guns. Part II. (Continued).

MEXICO. Mexico has adopted the Schneider- Canet equipment.

NORWAY. The Ehrardt, in 1904, provided with a removable shield carried on the wagon on the march.

ROUMANIA. A Krupp equipment.

RUSSIA. 3" Q.F., 1900 pattern.

As the result of many trials, carried out from 1898-1900, the Russian Government finally adopted a design by General Engelhardt.

The gun is of steel; weighs 6·91 cwt. Single action breech-screw similar to the Schneider-Canet pattern and fires fixed ammunition: it is composed of a carriage and sub-carriage; the former can be traversed along the axle; the latter recoils about 3 feet after each round upon runners in the carriage; the recoil movement is checked by a glycerine buffer and blocks of rubber separated by steel plates. The sighting apparatus is on the gun itself. The trail jumps when the gun is fired.

The shrapnel shell weighs 14·41 lb. and contains 260 bullets of ·375 oz.; the weight of the bullets is 43% of the shell. Initial velocity 1960 f.s., much greater than that of other guns; the remaining velocity at 2330 yards is 1115 f.s.; maximum range 5,800 yards. The fuze T and P. is of aluminium and weighs 9·65 oz.; it is ovoid in shape, like the Italian 75A; time of burning 22 seconds.

The weight of the gun is 37 cwt.; in spite of this they are remarkably mobile; in every respect they proved superior to the Japanese guns. The ammunition was excellent. But it was found that the rubber running up blocks deteriorated after some little use, and the guns did not return into the original position.

Besides this, the light and horse batteries have been armed with a converted 1877 gun, of 3·42" calibre. The recoil is checked by rubber blocks, on either side of the carriage; the trail is fitted with a spade to which it is attached by elastic blocks and the trail scarcely moves after the first round.

Initial velocity 2000 f.s. (?). Shrapnel, common shell weight 17·38 lb. (2¼ calibres long), and case filled with 102 zinc bullets 1·75 oz. in weight are used.

An improved 1900 pattern has now been designed, with longer recoil hydraulic brake and steel running up springs. It is to be fitted with steel shields, and a panorama sight; it is powerful but at the expense of weight, and of insufficient stability, and is rather an accelerated than quick firer, and is probably not Russia's last word on the question of Q.F. field guns.

Russia possesses no field howitzers; in the last war heavy howitzers were much employed in the field: at the Sha-Ho several hundreds were present.

SERVIA. Servia is about to adopt a Schneider-Canet equipment.

SWEDEN. Sweden has decided upon a Krupp gun 1902 pattern, similar to the Danish. The wagons are armoured in front. The shield are ·187 inches thick.

The Horse Artillery is armed with a similar weapon; but without shields or armoured wagons, the carriage is rigid, with a spade.

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The howitzer is similar to the heavy German field howitzer (1902) of 5·82 calibre, manufactured by Krupp, length of recoil, 23·55 inches, and can be traversed 2° to right or left. Weight of gun in action 43·6 cwt.; the shell is filled with 9¼ lb. of *Pinkrin* and the shrapnel contains 1,300 bullets of ·5675 oz.; total weight 92·5 lb. It has yielded satisfactory results at trials.

SWITZERLAND. The 1903, 75 m.m. (3 in.) gun.

The guns and carriages are built by Krupp, while wheels, wagons, limbers, ammunition are of Swiss manufacture; 800 rounds per gun are carried.

There are 72 four-gun batteries. The calibre is the same as the French gun, but the projectile is 13·35 lb. instead of 16·925 lb., and only contains 210 bullets instead of 300, and the initial velocity is 1905 f.s., instead of 2080 f.s.: the gun weighs 18·68 cwt., with ·12 inch shields, 12·2 lb. in weight; gun and limber 34·4 cwt. including 40 rounds: ammunition wagon 35·8 cwt. with 40 rounds. The lessened weights are owing to the configuration of the country.

The French elevating gear is considered too complicated. The system adopted allows of the angle of sight being given automatically and for passing easily from direct to indirect fire. The gun can be traversed about a pivot fixed to the front of the carriage.

The 12 cm. (4·69 inches) Q.F. field howitzer was used in the 1902 manœuvres for the attack and defence of positions in co-operation with Heavy Artillery, and in other trials, which resulted in its adoption.

Length 4·71 feet (12 calibres); weight 46·7 cwt. gun and limber, or 23·15 without limber; weight of projectile, 46·45 lb.; initial velocity, 525 to 980 f.s.; maximum range, 7,620 yards.

Shrapnel, common and torpedo shell were tried against all kinds of field works, and proved that the smallest charge, of which there are 5, was sufficent to ensure penetration in plunging fire; it was found that field gun shrapnel fire against objects in the open was much more effective; against targets behind cover plunging fire yielded better results; but with targets completely covered (head cover) even high angle fire was extraordinarily ineffective.

Trials are being made of a new 75 mm. (3 in.) Q.F. mountain equipment, 1906, with great success; it is non-recoil, with hydraulic brake and Krupp running up springs. Switzerland will have completely replaced the 1877 equipment with these guns by the end of 1907; 900 rounds per gun are to be carried.

TURKEY. Has at last found means to order 96 batteries of long recoil Q.F. Krupp guns, together with wagons and ammunition; the pattern is the same as the Danish.

Orders have recently been placed with the same firm for a further 62 field batteries of six 3 in. guns; 23 mountain batteries of six 3 in. guns; 3 howitzer batteries of six 5·9 in. guns; 3 siege batteries of six 3·92 in. guns.

Turkey possesses twelve 4·72 inch field howitzer batteries, two of which took part in the 1897 campaign.

URUGUAY. The gun is of 3 calibre, and consists of a bronze cradle carrying the gun on trunnions, and sliding itself on the carriage; the trail is fitted with a spade; the side brackets of the trail are curved thus bringing about the automatic return of the cradle which slides along them.

The projectile weighs 14·12 lb.; initial velocity, 1830 f.s. The equipment has proved itself good.

AUSTRIA. The gun is of bronze: calibre 3·06, long recoil, and is fitted with a Chrome steel shield ·172 inches thick. Projectile 14·72 lb.; initial velocity 1632 f.s. Weight behind the team, 35·4 cwt., or 42·5 cwt. with 5 numbers mounted: in action the weight is 19·85 cwt. Length of gun, 85 inches (29 calibres) with increasing twist. The breech is closed with a wedge, and only one motion is necessary. There are powerful running up springs which will return the gun into the firing position even when greatly elevated; there is also a control spring. Length of recoil, 49·2 inches. The top carriage, in which the gun rests, is mounted on the lower carriage fitted with brakes, and the sighting apparatus is fixed to the top carriage; elevation can be given between 18° elevation and 7½° depression. Maximum range is 7420 yards. Deflection may be given to 3° right and left about a pivot on the lower carriage.

Shrapnel and common shell weigh 14·7 lb. Projectile and charge are contained in a brass cartridge case. Both carry T. and P. fuzes.

The shrapnel is of steel and contains 316 bullets of ·326 oz., 16 of ·49 oz., and a bursting charge of 3 oz.

Common shell is filled with ammonal. The cartridge enclosed in a silk bag inside the brass case weighs 16·72 oz.

The whole limber with the exception of wheels and pole is of steel plate; it weighs 7·25 cwt. empty, 15·5 cwt. with 33 rounds.

The wagon limber is similar: the wagon body is armoured: weighs 36·3 cwt., or with 3 gunners mounted 40·6 cwt.; the limber carries 30 rounds, the body 60.

It is undecided whether there are to be 1, 2, or 3 wagons per gun (123, 213, or 303 rounds) 15 to 20 rounds per minute, it is said, can be fired: the gun does not move after the first round.

Publications.

The Germans under the French Eagles. The troops of the confederation of the Rhine (1806-1813). By Major Sauzey.

The Armies and Fleets of all Nations. Published by Berger-Levrault & Co., Paris.

June, 1907.

Sinicæ Res.

The right of nations and of Europeans among Asiatics in the Far East.

The French fleet in the Mediterranean and the African army.

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Routes for (French) troops on the march. Hints and suggestions.

An Historical study on Infantry guns.

In old days infantry battalions were frequently armed with light guns, relatively of a Q.F. nature, up to the 30 years' war Artillery matériel was so cumbersome and the practice of Artillery so little understood that the guns were able to take a secondary part only in a battle. The creation of a practical Field Artillery is due to Gustavus Adolphus, when he divided Artillery into light and heavy, the latter known as reserve Artillery, the former weak but mobile was turned over to battalions of infantry. The experimental gun was manufactured in 1624; in 1627, one made of boiled leather surrounding a copper tube was issued, but was found to have many disabilities; and other types were tried. Other countries then followed Sweden's example, France in particular armed each infantry regiment with 2 "Swedish pieces" in 1631. After various changes, Louis XIV., raised the King's Fusiliers in 1671, which in 1693 were transformed into Royal Artillery; he formed the Royal Bombardiers 1681, both these corps formed part of the infantry and were detailed to escort and serve the non-regimental Artillery matériel. Further progress was also made in this direction during the remainder of his reign. In the next Century (18th) Frederick II. and Maurice of Saxony the Austrians, and Gribeauval and du Brocard, two Frenchmen, brought about many improvements. In 1752, the English adopted guns of 14 calibres, weighing 270 lb. to 550 lb.

Then follows an account of various patterns of guns in use among European nations. By Capt. A. Brousse, Colonial Infantry.

Question of Artillery Tactics, illustrated by examples from the Russo-Japanese war.

Colonel Bielaieff's study.

In his account of the action at Tachitchao, he says that owing to their past losses, caused it seems probable, to the giving away of their positions prepared in advance, the Russians, this time merely settled the siting, and did not dig the trenches, so that the Japanese were unable to locate the intended position of the batteries, these latter bivouacked close by.

The normal interval between guns with the Japanese appeared to be 30 yards. Each Artillery commander carried with him a sketch of the country to his front with all prominent objects numbered and their bearings given, so that on the appearance of a target, it was only necessary to quote number and direction.

The Japanese attached great importance to emplacements occupied by officers directing the Artillery fire. Sometimes they detailed special batteries to fire upon groups of Officers and especially upon those directing the fire of Russian batteries. They themselves chose observation posts outside the beaten zone, far to flank or rear of their own batteries.

At Tachitchad, the Russian Artillery was not installed in its entirety at once in position of defence; but part only at first, destined for the fight at long range, a reconnoitring fight as it were.

The Japanese accustomed to the use of observers to a flank and helped by their Chinese spies, had no great trouble in soon weakening the Russian fire. As soon as they obtained this result they increased their range by 450 yards, and by means of their bursting shells maintained a zone of fire between guns and the ammunition supply, delaying the limbers and wagons; at the same time the infantry assumed a vigorous offensive.

The concentration of the Russian Artillery greatly assisted this and it was sufficient to put the personnel hors de combat to render the withdrawal of the guns almost impossible.

But this was entirely changed, by taking no notice of the enemy's reconnoitring batteries, occupying covered positions, already prepared beforehand with range, length of fuze, &c., &c., the Russian batteries were content to patiently observe the hostile position and await the moment when the enemy's batteries were about to instal themselves therein to open fire.

The Japanese generally opened fire very slowly, i.e., they took a long time preparing for the first round, this gave the Russians an extra chance during the preparation for action. The latter's silence during the fire of the Japanese reconnoitring batteries had already misled them, all the more since the Japanese endeavour to prepare their fire in advance.

During the battle of Tashichao, in most cases the Japanese replenished their ammunition by chains of men passing from the wagon behind cover up to the batteries.

The remainder is merely an account of the battle.

The Russian Infantry in Winter Garrisons. By Lieut Vergé.

Military Notes of the Month. Nothing of interest.

Publications.

The War in Mexico. The march of the 7th infantry regiment (1863-67). By Col. Bourdeau.

The loss of Alsace. By Major E. Picard, of the Artillery, *psc.* Published by Plon-Nourrit & Co., Paris.

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VOL. XXXIV.

CONTENTS.

THE PROPERTIES OF THE MODERN Q.F. FIELD GUN AFFECTING THE PREPARATION & CARRYING OUT OF FIRE.

:o:

Translated from "Memorial de Artilléria," January, 1907.

Communicated by The War Office.

EDITED, PRINTED AND PUBLISHED
AT
THE ROYAL ARTILLERY INSTITUTION, WOOLWICH.

OCTOBER, 1907.

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The Properties of the Modern Q.F. Field Gun affecting the preparation and carrying out of fire.

Translated from "Memorial de Artilléria," January, 1907.
Communicated by the War Office.

THE effect of giving elevation to a gun by tangent sight involved problems which have been already discussed. Today this elevation is universally carried out by means of a level and quadrant in some shape or another.

This change of system, however, has not entirely eliminated the former problems, but has somewhat changed their nature.

At present every apparatus designed to lay for elevation is also used for laying for line, so that we have preferred to approach the subject from a general point of view, giving especial attention to the questions involved in the angle of sight.

Assuming the principle of the invariability of the trajectory, we find that the elevation to be given to the axis of the piece, so that the mean trajectory should pass through any point corresponding to a range D at an angle of sight $\pm \Sigma$, is equal to the angle given in the tables of the gun for that range $\pm \Sigma$. For the purposes of this discussion we shall omit all factors such as wind, temperature, &c., which produce irregularities of range and fuze. Our assumptions will correspond strictly to the data given in the range tables.

If the angle of sight is correctly calculated and taken into account in giving elevation to the gun, then the bursts will occur in the required spot.

Example. Fig. 1:—

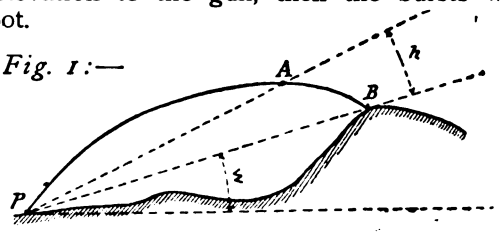

Fig. 1.

P = Gun 7·5 c.m. Q.F.
PB = Range 2,400 m.
Σ = Angle of sight + 1° = 17 thousandths.
APB Angle of elevation 3° 40′.
Quadrant elevation 4° 40′.
h = Height of burst = 3 thousandths.
Setting of fuze = 6·7.

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Now on the other hand if some error creeps into the calculation of the angle of sight the trajectory no longer passes through B, while the bursts no longer occur at A.

Example. Fig. 2:—

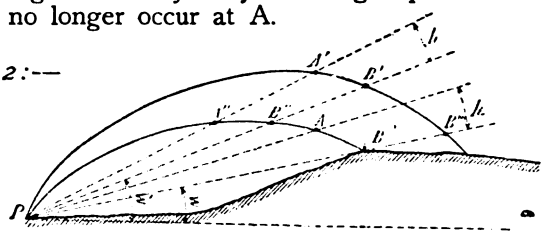

Fig. 2.

Gun . . . as above.
Range . . . do.
Σ = True angle of sight = + 1° = 17 thousandths.
Σ' = False „ „ = + 2° = 34 „
Angle of elevation = 3° 40′.
Quadrant elevation = 5°40′.
Setting of fuze = 6·7.
Height of burst above PB′ = 3 thousandths.

In this case a range PB^1 will be obtained over PB corresponding to 3°. 40° + (Σ' − Σ) = 4° 40′ or 2,800 m. and A^1 will occur at a height = 3 + (Σ' − Σ) thousandths or 20 thousandths. Now to bring the trajectory to pass through B it will be necessary to take a lesser angle of elevation with respect to the normal (3° 40′ − Σ' − Σ) or 2° 40′. This means firing at a fictitious range of 2,000 m. PB″. Then the fuze will be set 5·5, this being the correlative for 2,000 m. The burst A″ then occurs 400 m. back from the normal point. The result of this is that the axis of the piece is lowered by an angular value corresponding to 400 m. while the setting of the fuze is advanced by 1·2, meaning a certain number of divisions.

The above shows the considerable inaccuracy which may occur in giving angular elevation to a gun, as is done with nearly every modern sight.

In the case of the Spanish field (Q.F.) gun a difference of 1° in elevation = 500 m. in range up to 1,800 m., = 400 m. from 1,800 m. to 3,300 m. = 300 in ranges greater than 3,300 m.; in the case of the mountain gun 1° in elevation = 200 m. up to 3,000 m. and 150 m. for longer ranges.

Calculating the angles of sight in thousandths and taking 17 thousandths = 1° we find that an error of only 4 thousandths entails an error of 100 m. in the range for the field gun (or 50 for the mountain gun) at medium ranges. This means altering the fuze 2 and 1 divisions respectively if we go by the old rule of proceeding by units that produce 50 m. change in the point of burst, or a number of divisions equal to that of the thousandths in the error if we go by the modern rules for fire.

The Spanish School of Gunnery has recommended the adoption of a goniometric telescope, described in this Journal, December, 1905. To use this instrument in measuring "positive" angles the level is

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first set and the angle read off by aligning the telescope; if the angle be negative the telescope is first aligned, the angle is found by setting the level. The graduations only read in one sense; with negative angles, if the operation be reversed, the reading given by the disc and drum would have to be subtracted from 1,600.

This instrument combines every desirable quality—it is light, measures vertical and horizontal angles, however great, also heights and extents of front, and can measure heights of burst within a twenty thousandths upwards or downwards limit—all to an accuracy of one thousandth. It is undeniably superior to the French service pattern, and to Schneider's pattern, now used by Spain. With the latter it is not possible to measure angles of sight exceeding the micrometre scale (i.e. one degree). Again the horizontal scale reads in the same direction as the goniometre, which, when angular distances between real targets and auxiliary marks are being measured, involves taking readings first to the auxiliary marks and then to the targets. If there be only one auxiliary mark to N targets 2 N readings will have to be taken, whereas with the proposed instrument N + 1 readings would suffice. Moreover with the latter the instrument finally remains directed on to the real target.

When this telescope is used at an observing station far from the guns and there is an appreciable difference of level between these two points, the following process will have to be gone through, if the range between the telescope and target is not widely different and difference of level between telescope and guns can be approximately determined (figs. 3, 4, & 5) the formula $\Sigma p = \Sigma\alpha + \delta$ will give the required value where

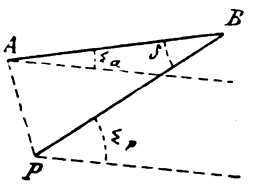

Fig. 3.

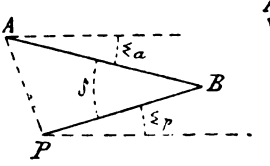

Fig. 4.

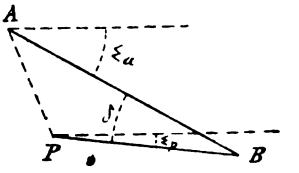

Fig. 5.

$\Sigma\alpha$ = angle of sight from telescope (A).

Σp = " " " guns (P).

δ = parallax between telescope and guns to target (B).

and giving $\Sigma\alpha$ its true sign, then taking δ from it with a positive sign where B is higher than P, but with a negative sign when the contrary occurs.

When the horizontal distance between A and P is of any serious importance Σp can be found if an approximate calculation of AB, PB, and AP is arrived at by measuring the angles of sight to B and P from A. This, with the distance A to P will give Σp.

As stated before, a difference of one division in the graduation of the fuze is equivalent to bringing the centre of bursts up or down

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one thousandth. It was also stated that this fact was not in accordance with the old rule which attributed to the division a difference of 50 metres in the range of the burst. From the range table of the field gun we get the following:—

If the centre of bursts in fig. 6 should occur at A, but is obtained at A″ at one thousandth elevation above A, the necessary correction can be obtained,

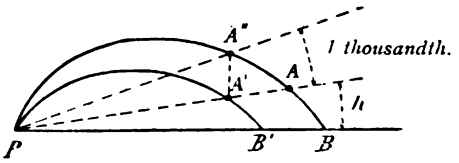

Fig. 6.

(a). by decreasing the angle of elevation by one thousandth without change in the fuze;

(b). by increasing the setting of the latter to correspond to the distance A″A in the trajectory without altering this.

Now by taking into account the proximity of A and B and the small value of the angles of descent, it may be assumed that the variation of range BB′ is equal to AA′ and equal to AA″; therefore, the increase AA″ in the trajectory may be put down as:—

	Range (in metres)	Value of AA″ (in metres)
Between	1500 – 2000	29·5
	2000 – 2500	25
	2500 – 3000	21·5
	3000 – 3500	18·5
	3500 – 4000	16.

To obtain these figures, the setting of the fuze must be altered:—

	Range (in metres)	Altered setting of fuze (in seconds)
Between	1500 – 2000	0·087
	2000 – 2500	0·079
	2500 – 3000	0·073
	3000 – 3500	0·067
	3500 – 4000	0·061

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With the mountain gun the following figures are obtained:—

Range (in metres)	Value of AA″ (in metres)	Altered setting of fuze (in seconds)
From 1500 to 2000	11	0·047
2000 2500	10	0·044
2500 3000	9	0·041
3000 3500	8	0·038

From the above we get these conclusions:—

(1). Equal variations of fuze do not at all ranges occasion changes of height of burst equal to a similar number of thousandths; the variations of fuze calculated for a medium range give the least appreciable inaccuracies.

(2). Diminishing or increasing the setting by one division according to the old rule is equivalent to raising or lowering the height of burst by two or two and a half thousandths in the case of the field gun, five thousandths in that of the mountain gun.

(3). That a fuze setter is required, fitted with a corrector to produce variations in the height of burst of such a nature that the lowest limit of change be equal to one thousandth in the case of either gun.

(4). The composition of the fuze must be allowed the greatest possible bulk so that the same period of time may correspond to the greatest possible length of the composition.

(5). The probable error in the composition must be less than the value of the smallest variation to be used in the graduation of the fuze.

(6). If in place of increasing or diminishing by divisions on the old time scale, the new divisions of the fuze are used (one-tenth of a second). With the field gun variations in the height of burst will be obtained approximating to one thousandth, with the mountain gun these will be two thousandths. To obtain similar results with the time scale the latter would have to be graduated in 25 metres.

From the above it is seen that although the adoption of

(a). the new battery telescope,

(b). the new "clitograph" graduated in ranges with correction for angle of sight mark a great advance in the facilities for laying for elevation, nevertheless the service Spanish equipment still suffers from the absence of

(a). the independent line of sight;

(b). "independent elevation" i.e. the means of giving a gun elevation from zero irrespective of the angle of sight;

(c). the automatic fuze setter; also

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(d). lastly the absence of entire harmony between the various factors, into which the modern accepted unit of angular measurement enters—i.e. the thousandth—and the fact that a degree of accuracy corresponding to this unit cannot be strictly attained.

As far as fuzes go less latitude should be allowed than at present, seeing that the present Krupp type in series of 20 rounds at a range of 3100 metres (with the field gun) does not give a dispersion of less than 150 metres.

The question as to engraving the fuzes with time scales or ranges is important. With a good fuze setter it would seem unnecessary to have a scale at all. If indeed engraved fuzes are necessary in view of a possible break down of the setter, then time scales appear preferable because range scales introduce no simplification, (since generally the scale would not agree with the actual range given to the gun, fictitious or otherwise), also because range scales would necessitate different fuzes for different kinds of gun.

The experience of the Manchurian campaign shows that fuzes without scales would prevent an enemy from obtaining information as to the ranges to the opposing guns.

Further it is important for time fuzes to possess a time composition allowing fire at extreme ranges, not only because modern guns possess sufficient power to put out of action living targets with shrapnel at 5,000-6,000 metres, but also since it is only with long range fuzes that balloons can be attacked.

As modern guns range up to 8,000 m. and in some cases even to greater distances, it is clear that in firing at balloons this capacity for long range fire cannot be utilized—still less if the wheels be raised and the trail dug into the ground.

In the Manchurian campaign the Russian gun Mark 1,900 could with its fuze range to 5,500 m., while the Japanese weapon Mark of 1898 only reached 4,300 with time shrapnel, so the latter on many occasions was limited to common shell when attacking the Russian guns regardless of the question whether this projectile was the most suitable.

The new aluminium fuze seems more suitable since by using this metal we obtain 6½ ounces more weight available for shrapnel bullets. But experience must show that the aluminium fuze does not entail counterbalancing disadvantages due to difficulty of manufacture, resistance and accuracy, &c.

The automatic fuze setter:—

This enables a greater rapidity and accuracy to be obtained in setting fuzes; it renders unnecessary the Spanish "time scales" and the special graduations on certain sight mechanisms; it fulfils the condition that all ranges require corresponding graduations of the fuze.

The ring or disc for ranges must admit of 25 metre variations, necessary in fire at an unchanged elevation, and the corrector must allow for a sufficient latitude of + or − correction; this should be 25 divisions (of 25 metres) + or − for field guns, 50 divisions for mountain guns.

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Laying for line:—

The goniometric telescope, the goniometre, and the little scale described in the December number (1905) of the " Memorial," and in the instructions drawn up for their use fulfil all requirements. (The Spanish goniometre is fitted with a 4 diameter Zeiss glass (single).

Experience has shown the telescope to be superior to the collimator in regard to accuracy, field of view, clearness, and length of range. It is easily handled and can be set to focus by any soldier.

Now in dealing with shielded materiel it is not the ordinary telescope that is the best instrument but the "panoramic" glass. With the former, the choice of an auxiliary mark in advance of the gun, already limited by having to take up positions in rear of a crest, becomes still more limited. These marks, therefore, have frequently to be found to a flank or to the rear. The eyepiece of the telescope has now to be moved, the layer changes his position and the working of the gun suffers.

But with the panoramic sight all this disappears, since the eyepiece of the telescope remains fixed. This has led to the widespread adoption of the instrument devised by the Swiss Captain Korrodi, and manufactured by Goerz.

The French Artillery gets over the difficulty by raising the collimator to a height of 1 metre 80 c.m. above ground, but this might affect the accuracy of the laying, while it certainly exposes the layer. Since 1902, the panoramic sight has been gaining ground very rapidly. That adopted by Roumania, the invention of Colonel Ghenea is one of the most perfect yet devised. It has compensating gear for the angle of sight, for lateral deviations due to drift and level of wheels; it is fitted with a goniometre and Korrodi sight.

The Krupp gun to which it is fitted, however, has no "independent elevation," and for this reason the Ghenea sight is more complicated than it need be.

To sum up our criticisms to this point and demonstrate fully the value of the "independent elevations," we will apply our ideas to a gun which possesses this valuable adjunct, also shields and the remaining qualities of a modern Q.F. weapon.

Once the laying for elevation is divided into two actions—finding the angle of sight and putting on the elevation—the sight can be constituted of two instruments—the level and the range drum. The former is graduated into thousandths, reading to one of these units and will allow of a latitude of 100 such units in each direction for a field gun and 200 for a mountain gun; the drum is graduated in ranges, and will, when necessary be legible to 25 metres.

The calculation of lateral displacements is carried out by means of a goniometre graduated so as to give the circumference a whole number of hundreds of thousandths, and allowing a reading to one thousandth.

The battery telescope must be capable of reading angles of sight as shown above; in measuring horizontal angles the first reading must be that to the auxiliary mark.

The sight will by preference be a panoramic telescope fitted

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with an auxiliary open sight which is useful in picking up targets or for those at very short range.

The gear for correcting for drift and for level of wheels is not absolutely essential and may be omitted if it be found that it offers too many complications.

The mechanism for giving the gun lateral movement both in direct and indirect laying should be based on the idea that one turn of the hand-wheel is equivalent to any whole number of thousandths.

The double action fuze will be selected for accuracy and length of composition.

The fuze setter must allow each division on the corrector to alter the height of the burst by one thousandth; the graduations on the corrector and disc of the setter will be as shown above.

Taking the French gun of 1897 as an entirely harmonious and perfect mechanism, except in lesser details, as regards the sight gear, fuzes, and setter, we will now discuss some points in connection with it.

The goniometre consists of three parts, collimator, disc, and drum. The first is similar to the Schneider type recommended for special reasons for the instrument now in use in the Spanish Siege and Fortress Artillery..

The ring (figs. 7 and 8) is graduated by two hundredths of thousandths numbered from 2 to 14 in each quadrant. (1400 thousandths per quadrant).

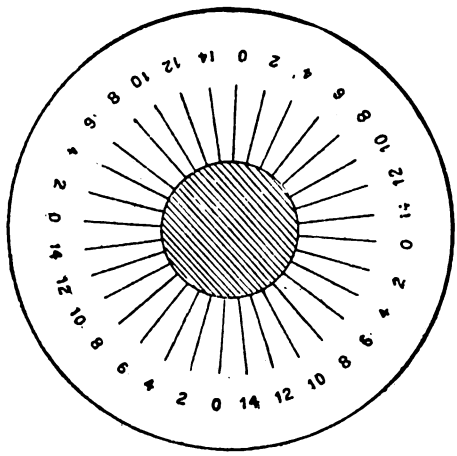

Fig. 7.

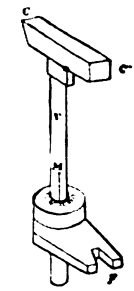

Fig. 8.

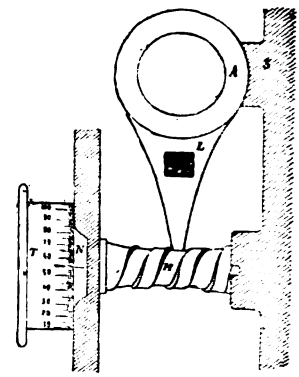

Fig. 9.

The drum T (fig. 9) is divided into 200 thousandths.

Now when the index M of the drum is at zero and that of the drum N at 100, the axis of the collimator CC^1 lies in a

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plane parallel or perpendicular to that of the gun. The socket of the goniometre A is fixed to the cradle S. The stem V can be rotated in two ways.

(1). by hand, after pressing it down so as to release a toothed disc from the disc;

(2). by the drum; in this case the screw H, the piece K. the lug L and the fork F transmit the movement to the stem V, which is now linked with the disc.

The first method is used for quick motions, the second for slow movements; the two hundred thousandths are put on by hand, the units by the drum.

In practice and owing to the arrangement of the graduations on drum and disc it may happen that the layer cannot readily, or without making a mistake, make the necessary calculations to give the goniometre the necessary inclination to correct or alter the line of fire, especially if these calculations affect both drum and disc. Modifications to obviate this are now being tried.

Another drawback is the use of the collimator as sight; the collimator is not so good for this purpose as a telescope.

The battery telescope, Mark of 1898, as stated above does not fulfil all requirements.

The French gun possesses no means of correcting for drift; as the latter only means some 2 metres at 2,000 m., and 6 at 3,000 m., it seems, to our judgment at least, infinitely preferable to neutralize it together with other causes by correcting rather than by introducing further mechanism.

The same applies to lateral correction for level of wheels, with the difference that when there is an appreciable difference of level, section leaders will alter the deflection[1] by five thousandths for every 15 c.m. (6 inches) of difference, adding when the right wheel is lowest, subtracting when vice versa.

The B.C. will correct for wind, five thousandths for medium or strong wind at average ranges, ten thousandths for a very strong wind, or at extreme ranges; this will be added when the wind blows *to* the right and subtracted vice versa.

The French gun like the Spanish Schneider weapon has the necessary mechanism to allow the carriage to slide along the axle. The maximum movement is equal to 104 thousandths (52 each way) each turn of the hand-wheel being equal to two thousandths. This system is superior to the Krupp and Saint Chamond patterns for the gun and carriage are more rigid, while the axis of the piece and the trail always remain in the same vertical plane.

To bring the French gun into action (abattage). The shoes, Z (fig. 10), are allowed to fall to earth and the trail is lifted up, with the result that the piece A slides along a bar below the trail lever until it is secured by a catch F. This catch is only to be released by direct pressure on it. On again pressing down the trail to the ground, the gun wheels will rise up on to the shoes.

[1] Measured thus: Aiming point, gun, true target.

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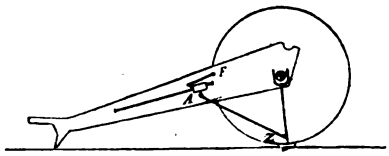

Fig. 10.

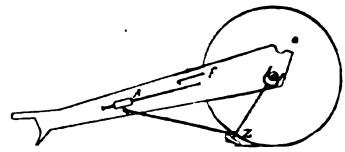

Fig. 11.

The detractors of this system are many. It is urged that when a moving target is under fire it will rapidly pass out of the zone of lateral movement of the gun (3° each way), and that this, as well as any change of target, requires a fresh "abattage." The strongest argument against the manœuvre is the fact that the French Regulations often recommend that it be dispensed with.

The independence between the operations of laying and elevating the gun are obtained as follows:—

The gun and recoil cylinder rest by means of horizontal trunnions on a cradle (fig. 12) mounted on the carriage, resting on the latter by means of trunnions whose axis coincides with that of the former pair. The cradle ends in a toothed rack. This rack is set in motion by the mechanism shown in fig. 13 and the layer's elevating wheel set on the left of the trail. The collimator always moves with the cradle.

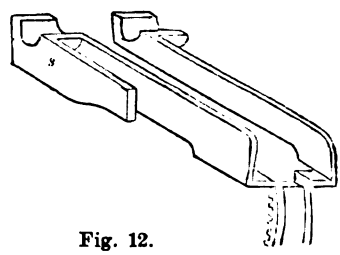

Fig. 12.

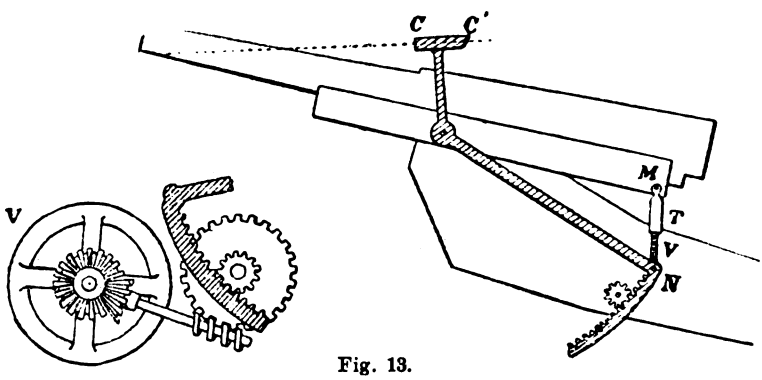

Fig. 13.

Since the gun and cylinder are united to the cradle by the screw V and the screw socket T it follows that by revolving the screw socket T we impart motion to the gun and cylinder (fig. 14), and since M N is a variable distance we move the gun independently of the cradle. Motion is given to the gun by the elevating wheel by means of the gear shown in fig. 15. This gear is such that when the axes of the gun and collimator are parallel the figure zero appears on the range disc I. On any departure from this position the numbers then shown on the disc are equivalent to angular distances between those axes.

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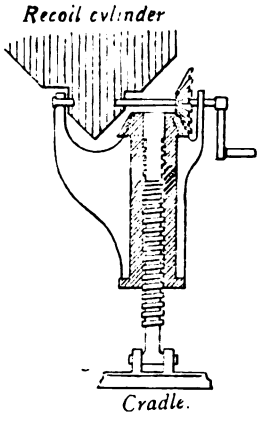

Fig. 14.

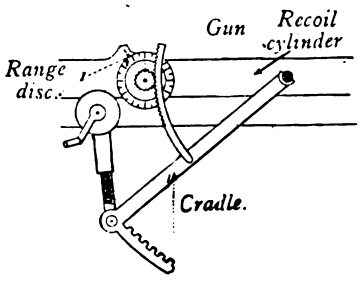

Fig. 15.

If the layer, therefore, aligns his collimator on to a target, and elevation equal to the range is given to the gun by means of the range disc I, the gun will then have an elevation equal to the angle of sight and natural elevation for the range.

In indirect laying the level shown in fig. 16 is employed. This

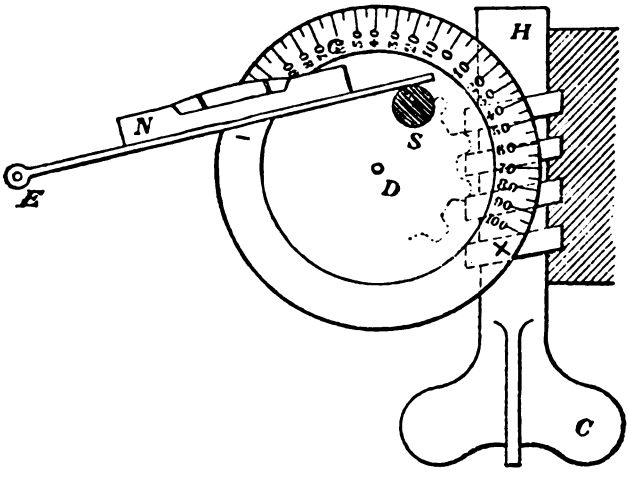

Fig. 16.

is placed on the extension of the cradle showing on the left cheek of the carriage as in fig. 17. On turning the head C of the endless screw H, the spirit level N is inclined since one extremity E is fixed, while the other rests on the projecting stud S, the latter being set eccentrically on the disc D. The inclination is then shown on the graduations G. When the bubble is steady midway in its run, and the graduated disc reads zero then the collimator is horizontal, but should the disc, when the bubble is level, show any reading, then the collimator is forming with the horizontal a positive or negative angle whose value is shown on the disc in thousandths.

The level is used to find angles of sight; if the collimator be

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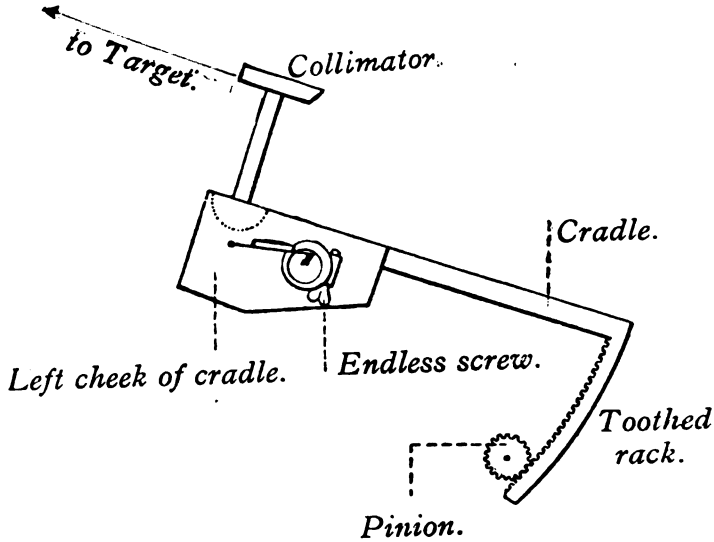

Fig. 17.

laid on the target and then the bubble be levelled, the reading of the angle is obtained. The process, if the target is not seen or vanishes, can be reversed, i.e. the disc is set to any reading and the bubble brought level by means of the layer's elevating wheel.

In indirect laying the angle of sight is found by telescope, by map, or other means, and is then given to the gun by the above process; the elevation for the range is next put on by the gun elevating gear and disc; the result is the quadrant elevation on the gun.

Even in direct laying, once the collimator and level have given the angle of sight, every round after the first can be laid for elevation by keeping the bubble level.

It is found that after the first round the laying for line requires so little attention as to be negligible in rapid fire, but the elevation requires some attention as the trail spade sinks into the ground. The laying falls into two parts, both carried out simultaneously by two different gun numbers. The layer seated on the left of the trail holds the traversing wheel in his left hand and his elevating wheel in the right. He only has to keep the line of his collimator on to his target or auxiliary mark, and to maintain his bubble level. The firing number, seated on the right of the trail, opens and closes the breech, gives the gun the elevation ordered by means of the gun elevating wheel and fires without reference to what the layer is doing. This is of especial value in searching and sweeping fire.

The remaining points worth noting are,—the elevating wheel (gun) by one turn elevates or depresses the gun one degree, and this turn is divided into a number of fractions such that one of these is equal to moving the gun through an angle equal to one thousandth; also the collimator which usually stands 1 m. 20 c.m. above ground can by lengthening rods be raised to 1 m. 50 c.m. or 1 m. 80 c.m. The use of these is to allow the collimator to clear the wheels, shield, &c., of the gun. As stated above, the panoramic telescope obviates

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this trouble, and, moreover, largely facilitates laying back on an auxiliary mark.

The only objection that can be raised against the elevating mechanism refers to the graduation of the sight level. The distance which separates the graduations is equivalent to 5 thousandths. This would appear to militate against the corrections in the height of bursts being obtained with all possible speed and precision, especially on occasions when a correction is to be carried out equivalent to one thousandth by modifying the angle of sight in place of altering the corrector. (See below).

The French double action fuze, shown in figs. 18 and 19, does not vary from other similar fuzes except as regards the timing device and the method of starting the same. The composition surrounds the outside of the body of the fuze, shaped like a truncated cone, spirally, and is graduated in seconds and tenths of seconds.

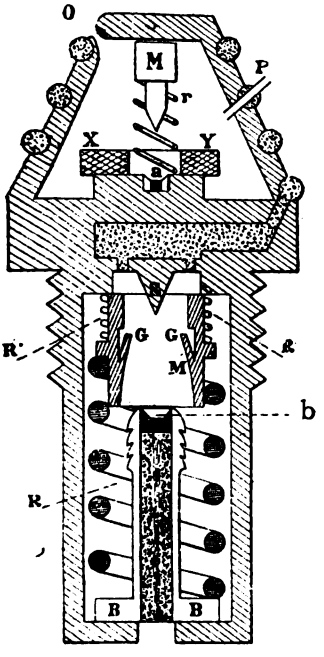

Fig. 18.

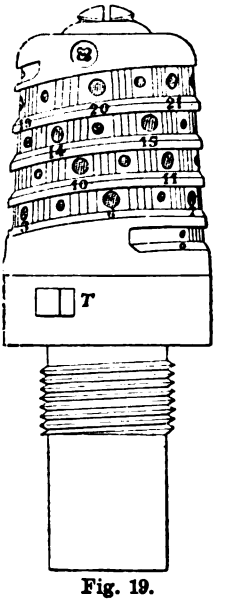

Fig. 19.

This spiral is perforated at any given place as at P in fig. 18. On the shock of discharge the pellet M falls on the cap a which explodes and ignites the cake of powder XY; this deflagrates and ignites the composition spiral through P. The composition above P burns away, but below P it burns until it fires chamber C; this ignites the cap b and the powder stick c thus bursting the shrapnel. If the spiral is not perforated, the fuze only bursts on impact, similarly if the fuze has been set too long it will similarly burst on impact.

The fuze composition is extremely long and so acts with considerable accuracy. It is also always ready for use, since the spring

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R, which offers no resistance to the recoil of H* when the projectile begins to travel, yet offers an absolute guarantee that it will prevent any action of the fuze due to road shocks, fall, or other accident.

The length of composition of time shrapnel fire up to 5,500 metres:—

There is one possible objection to the system of timing described above, namely, that once a fuze is perforated it can never be set again for longer distances although it may be utilized at shorter ranges. To avoid this it is ordered that no fuze be set before it is to be used, and the fuzesetters are carefully trained to follow the orders given to the sections.

Article 237 of the French F.A. Regulations, states, all shell with perforated fuzes are to be thrown away in war or placed with the empty cases in peace.

The automatic setter (fig. 20) allows for the simultaneous perforation of two fuzes. It is composed of a rectangular box, with a dial, graduated in 50 metres, which can be revolved by means of the handle (M). There are two gun metal cups (O) for the noses of the shell, a corrector C, two perforators LL¹, two levers to work the latter, and a mechanical system which transmits the movement of the plate P to the recesses O.

The corrector consists of a movable index with an arrow mark, and a butterfly nut to fix the index. There is a graduation strip numbered 0 to 40; the figure 20 is the normal position for the index.

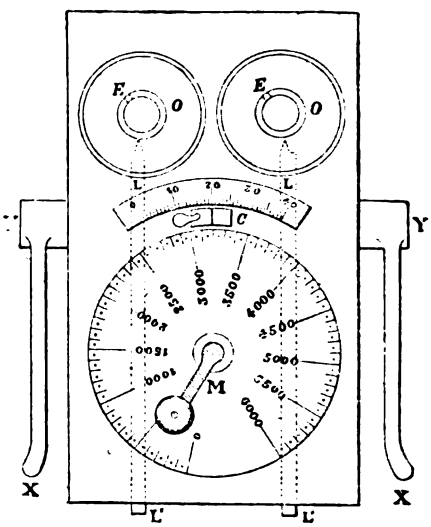

Fig. 20.

In each nose cup is an opening through which passes the fuze. The nick E fits over a corresponding stud on the fuze. The fuze is thus held fixed with regard to the nose cup and revolves with the latter when this is set in motion by the cogwheels operated by the lever.

But the cups are also set in a screw socket and in turning have also an upward or downward motion; the pitch of this screw socket is identical with that of the spiral composition on the fuze.

When the handle M is turned the ranges on the range disc passes in front of the arrow head on the corrector; the cups are rotated and at the same time rise or fall, thus exposing the entire length of both the spirals of composition to either perforator.

The apparatus is so constructed that when the corrector stands at 20, the burst of the shell at any range, excluding of course all

* Mistake here in original (for B?).—Translator.

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abnormal conditions, will occur at the normal height of 3 thousandths; every division, moreover, on the corrector is equivalent to a rise or fall in the burst of one thousandth.

The relation between the units of measure is the cause of the height of burst remaining constant, when in making an increase or decrease on the corrector, an identical increase or decrease is made in the angle of sight.

Thus a certain height of burst having been obtained with—corrector 20 and angle of sight + 30 this height will be maintained through the following combinations:—

Corrector	40	angle of sight		+ 10
"	35	"	"	+ 15
"	30	"	"	+ 20
"	25	"	"	+ 25
"	15	"	"	+ 35
"	10	"	"	+ 40
"	5	"	"	+ 45
"	0	"	"	+ 50

Because, if the corrector alone is changed, the range being the same, the trajectory remains the same, the point of burst moving along it. Now when the angle of sight is changed, the elevation of the gun is changed, and the trajectory, therefore, is made to revolve so to speak, without altering the point of burst along it.

The study of the simultaneous working of the corrector, angle of sight and range gives the following interesting conclusions:—

Assuming normal conditions, in fig. 21 we find the trajectory

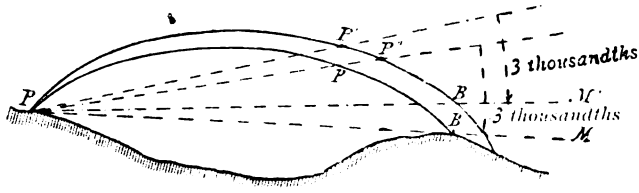

Fig. 21.

passing through target B, the range (D) being 2,100 metres and $\Sigma = 25$ thousandths; then the centre of burst will be at P at the standard height, that is,

$\Sigma = +25$
corrector 20
elevation 2,100 m.

But with corrector 20
elevation 2,100 m.

we get a wrong angle of sight, say + 30 the centre of bursts will be at P^1 on a trajectory too long in relation to the target and at a greater height with regard to B than 3 thousandths.

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The bursts at P^1 will be equivalent to

$\Sigma = +30$
corrector 20
elevation 2,100 m.

Since the height of burst is exactly 5 thousandths, = the amount of error in Σ, if the corrector is set to 15, we get P″ at the standard height owing to the correlation existing between the graduations of the corrector and the sight level.

The data for P″ will then be

$\Sigma = +30$
corrector 15
elevation 2,100 m.

But now although the height of burst is corrected, the interval is not corrected since P″ is on a longer trajectory, and in order to bring it back to P the elevation will have to be decreased to an amount of range equivalent to 5 thousandths in the angle of elevation (125 m. in the Schneider Q.F. gun) and we finally obtain P in its correct position by either of two sets of factors:—

$\Sigma = +25$, corrector 20, range 2100
$\Sigma = +30$, corrector 15, range 1975

From the above we deduce:—

(1). If Σ is positive, a plus error in its calculation leads to a corrector value of less than 20 and vice versa; the difference from 20 in either case being the number of thousandths in the error of Σ.

(2). If Σ is negative, a minus error in its calculation leads to a corrector value of less than 20 and vice versa; the difference from 20 being equal to the number of thousandths in the error of Σ.

(3). If Σ is positive, a plus error leads to a fictitious range less than the actual range, the difference between these two ranges being equal to the value in thousandths of the error in Σ; a minus error has the converse effect.

(4). If Σ is negative, a minus error leads to a fictitious range less than the actual range, and inversely a plus error to leads to a greater range, the difference in either case being as in result (3).

These results have been worked for the French Q.F. gun as follows. (Revue de Cavalerie, Oct. 1906).

Angle of Sight.	Corrector.	Range.	Height.
More than + 45	—	—	over 42 m.
+ 45	0	1575	42 m.
+ 40	5	1725	31·5
+ 30	15	2000	10·5
Correct + 25	20	2100	0
—	—	—	—
+ 20	25	2250	10·5
+ 10	35	2500	31·5
+ 5	40	2650	42
Less than + 5	—	—	over 42.

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Further if a battery has corrected its fire and the data obtained are to be taken by another battery about to open fire on the same target from the same position, it will require three factors to work upon, i.e. angle of sight, corrector, and elevation.

When it is required to find the range of a target on which a battery has succeeded in ranging, omitting atmospheric influences, this range will be found by reading off the figures on the disc of the automatic fuze setter which stand in a line with the 20 on the corrector, irrespective of the position of the arrowhead of the corrector.

The facility of the French gun for correcting heights of burst by varying the angle of sight becomes a necessity at times, as the corrector only allows for variations equal to an angle of 20 thousandths. So when the error in the angle of sight exceeds this quantity, a circumstance which may occur fairly frequently as the battery telescope only admits of the measurement of angles not exceeding one degree and a few minutes. In the case of the measurement of greater angles by the sight level, as stated above, this level does not give readings of less than five thousandths which would appear an insufficient degree of accuracy.

In field artillery the only magnitudes to be considered are distances and angles, and so nothing seems simpler than to select metres for the first and thousandths for the latter. This ensures the facility, essential to work carried out under difficulties, and the simplicity which can be obtained by a rapid conversion of metres to thousandths and vice versa.

The importance of the angle of sight is best shown by summing up the French Regulations on the subject; Vol. i. cap. " Preparation of fire."

Art. 270. *Angle of Sight.* When opening fire at a fixed target the angle of sight is usually found by the sight level. It is of the highest importance to find this factor accurately.

Art. 280. *Range* is found by map, sound, or rangefinder. But it must be remembered that any such calculation can be rendered useless by a false measurement of the angle of sight.

Art. 281. *Corrector.* A shell is said to burst at the standard height when its point of burst is seen from the battery to form an angle of 3 thousandths. This height gives the greatest effect of fire. This is normally obtained with the corrector at 20, but atmospheric conditions, false angle of sight, &c., can upset this. The reading of the corrector, when the correct height of burst has been obtained, should be used for a second opening of fire on the same day and with other correct data.

In the second volume, when dealing with fuze setting; it is stated:—

Art. 236. If an incorrect reading of the angle of sight has been used, the bursts will occur above or below the normal at an angular distance equal to the error.

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This error in the angle of sight must not be allowed to be too great as the corrector only admits of 20 thousandths correction either way, and this might not, with large errors, be sufficient to allow of the standard height of burst being obtained.

A false calculation of the angle of sight also has the serious drawback of falsifying the range and the corrector, with the result that difficulties might arise if these data were used by other batteries ordered to carry out fire from the same position.

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Reports, Precis, Translations, Etc.

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CONTENTS.

Artillery concealed or in the open. Extracted from the "Revue d'Artillerie," May, 1907. By Colonel A. H. C. Phillpotts, late R.H.A. 267

Russia. Abolition of Machine Gun Companies, &c. Translated from the "Revue d'Artillerie," May, 1907. By Col. A. H. C. Phillpotts, late R.H.A. 270

"Streffleur's Militärische Zeitschrift." Précis of contents. By Lieut. C. O. C. Hunt, R.F.A. 271

"Revue Militaire des Armées Etrangères. Précis of contents. By Captain F. A. Buzzard, R.F.A. 277

"Les Spectateur Militaire." Précis of contents. By Major E. P. Smith, R.F.A. 278

The new Italian Field Artillery Equipment. Translated from "Neue Militärische Blätter," No. 12, of September 15th, 1907. By Captain F. A. Buzzard, R.F.A. 279

"Militär Wochenblatt," Précis of contents, July, August, September and October, 1907. 280

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Artillery concealed or in the open.

Extracted from the " Revue d'Artillerie," May, 1907.

By COLONEL A. H. C. PHILLPOTTS, LATE R.H.A.

The article in " Revue d'Artillerie" being a translation from the German by Captain P. J. Marie of the French Artillery.

IN future warfare will our artillery be under cover or in the open? Will its fire be direct or indirect?

Our manœuvre regulations at present consider the employment of direct fire as the normal condition. Which means that the artillery position will be either on the crest of a hill or immediately behind it. The guns are laid directly on the object and consequently in full view of the enemy, thus allowing him to measure the range exactly, and pour in a crushing fire. On the other hand, the hidden position is considered an exceptional one, from which only indirect fire can be used. The enemy cannot then fire with crushing effect, and in our opinion he cannot get the bracket.

We are aware that the French opinion is diametrically opposed to this. The Russians follow their example. The Japanese also are of the same opinion, and we cannot accuse them of lacking *élan* and the spirit of offence.

There is, however, a slight tendency to adopt the new principle of indirect firing, but the general opinion still holds to the old one when guns were by far less efficient than at present.

We will examine some of the reasons which lead to so much opposition to the indirect method of laying.

1st. The trifling result of artillery fire during the war in the extreme East. " We are certainly safely esconced under cover, but we do not hit." There is no doubt that fire effect is slight, but that is due to the enemy being under cover, and we shall not alter that by exposing ourselves.

French and Russians will be under cover. We shall see nothing of our adversary, and we shall only be able to reach him by a method on which we unfortunately cannot count upon much efficiency.

In any case we should not leave the enemy able to employ very efficient methods of fire, and this would be the case if we exposed ourselves in the open to their fire.

2nd. To this, the answer is. It is exactly because now that we are protected by shields that we should first instal ourselves under cover, so as to be able at any moment to oppose efficiently the infantry attack.

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No doubt shields are an efficient protection against shrapnel, as long as it comes against our front, but this protection is entirely insufficient against percussion fire.

The great efficiency of shrapnel against artillery without shields has compelled us to adopt these in order to enable us to fight with equal chance against the enemy. We should remember the incontestable fact that every artillery with shields in action in the open must eventually give way to the shrapnel fire of an enemy under cover.

It is a well recognized fact that battles will in future last several days, and a considerable provision of ammunition should be made for the attack of positions. The artillery of the defence, generally the weakest, has every reason to choose positions under cover, so as not to be exposed to percussion fire.

Nothing could please the assailant better than to be able to first annihilate the enemy's artillery so as to at once proceed under the best conditions to the execution of the attack of the infantry.

Let us imagine a battery partly under cover having to engage a battery completely concealed. The former pours into the ground a rather feeble shrapnel fire, the latter, on the other hand, directs a most effective percussion shrapnel fire on the enemy's guns. The result will not be doubtful, the *matériel* of the artillery in the open will be destroyed, if not annihilated.

3rd. In future there will be no more decisive artillery combats. There will certainly be a decisive result, but it is easy to foresee that it will be to our detriment. If on the contrary the enemy should take up a position partly hidden, our projectiles will easily reach him whether they are hurled from a covered position or not.

A duel of two artilleries preceding the decisive attack of the infantry and carried on until one of them is placed out of action, will no longer be possible.

4th. This participation in the infantry attack will become impossible if the artillery is established in a covered position beforehand.

On the practice ground this appears unanswerable, where, after an artillery struggle of a few minutes duration, some riflemen spring up from the ground on a call from the telephone, all along the slopes only visible from the crest.

To facilitate changing from the covered emplacement to a partially covered one, or one in the open, it may be noted that it is quite possible from a position under cover to take part in the infantry attack at medium distances even when firing at moving objects.

That, however, is only impossible against near targets, because with direct fire alone is it possible to follow rapid changes in the situation.

It is a well known fact that indirect fire is still quite new to us. We are deficient in the necessary practice.

There is also a considerable difference between the moving target on the practice ground which appears suddenly anywhere, begins to run and then disappears, and a real line of riflemen who

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have already been a bit shaken by artillery fire, advancing by rushes and possibly eventually may be beaten.

5th. There is another objection which is always made, that this mode of fire is slow and complicated. It is quite true that the first shot is not always fired as quickly as superior officers desire at manœuvres, or even on the practice ground.

But this impatience exists only in peace time. In war time there is no such hurry, at least in most cases.

Artillery should always have time given it to make the necessary preparations without hurrying it.

At the commencement of a big engagement we are absolutely compelled to take plenty of time. The effect produced by artillery fire on artillery furnished with shields will not be immediate in the same way that we have hitherto been accustomed, more especially if the artillery is under cover, as is the case with our opponents. There is no longer so much a question of firing the first shot as of firing after a complete and careful preparation.

Indirect firing is by no means so complicated as many would say it is who have not worked it out. On the contrary, by using it, a large number of complications in firing can be got rid of. If the battery commander and the *personnel* are familiar with the system the technical questions are very simple, and the procedure for laying, at least in so far as the layer is concerned, is simpler than heretofore. The battery commander has his battery at least as well in hand as during direct fire, and there is no question but that the battery works more quietly, more surely, and more mechanically, in the hands of its commander.

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RUSSIA.

Abolition of Machine Gun Companies and establishment of Machine Gun Detachments attached to regiments and detached battalions of infantry.

Translated from the " Revue d'Artillerie," May, 1907.*

BY COLONEL A. H. C. PHILLPOTTS, LATE R.H.A.

The Regimental Commander will have the same authority over the machine gun detachment as over the other units. He will detail a senior officer who will have the powers of a battalion commander to look after and command the detachment.

The commander of the detachment will be chosen by the battalion commander from the young officers not under the rank of Lieutenant.

This officer will be entirely responsible for the instruction and administration of his detachment.

The men of the detachment who will be selected from the Regiment, should *as far as possible know how to read and write*, have good sight and be well disciplined.

The non-commissioned officers will be chosen from the detachments who have already a good knowledge of the working of machine guns.

The horses will be selected from the transport, pack animals being preferably selected.

In each detachment there will be two machine guns in peace time, and four in war time.

The peace time establishment will be gradually increased to four as funds become available.

The attached table gives the establishments.

Strength of a Machine Gun Detachment.

	Mounted detachment		Pack detachment		
	Peace.	War.	Peace.	War.	
Officers	2	3	2	3	To each gun are attached one senior N.C.O., 1 layer, 2 gunners, 1 driver.
Feldwebel		1		1	
Non-com. Officers	4	6	4	6	In peace time, the officers, 3 N.C.O's, and 1 rank and file are mounted.
Layers	4	4	4	4	
Rank and File	14	27	16	43	In war time, the officers, the feldwebel, 4 senior N.C. officers, 1 junior N.C. officer in charge of the ammunition wagons, and 2 rank and file are mounted.
Artificers	1	2	1	2	
Train	2	5	2	5	
Total excluding officers	25	45	27	61	
Officers chargers	2	3	2	3	
Saddle horses	4	10	1	7	
Draught or pack horses	4	17	4	21	
Total	10	30	7	31	
Guns	2	4	2	4	
Ammunition wagons		4		4	The train is not horsed in peace time.
Transport wagons		4		4	
Forge		1		1	

* The article in the "Revue d'Artillerie," is a translation from the "Russki Invalid."

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Streffleur's Militärische Zeitschrift,

WITH WHICH IS INCORPORATED

Organ der Militärwissenschaftlichen Vereine.

Précis of Contents.

By LIEUTENANT C. O. C. HUNT, R.F.A.

April, 1907.

Notes and observations by combatants in the Russo-Japanese war.

Japanese officers have frequently asserted that a Russian half- battery—4 guns—represented a 6-gun Japanese battery in fighting efficiency. In the defence especially, the short range of the Japanese gun placed it at a disadvantage since the attacker could put his guns into position out of range of the Japanese Artillery.

The difficulty in silencing the mechanically superior Russian guns, experienced by the Japanese even with a great numerical superiority of guns compelled them to defer their attacks till after nightfall, since the enemy's fire was less effective in the dark.

The great Japanese strength in Mountain Artillery produced its effect, not only in hilly country, but also in low lying country during the heavy rains. Owing to the long range of modern infantry fire and the increased effect of Q.F. guns, positions had to be taken up when far from the enemy; the artillery duel engaged in at ranges over 4,400 yards.

Conspicuous rising ground was avoided and Artillery positions chosen on cols, which afforded protection from flanking fire, or else behind gentle folds of ground.

The task of the defender's artillery in choosing a position is a somewhat more difficult one. If the intention is to keep the ground to the front under fire up to the last moment, a forward position, on occasion right up in the Infantry line, must be taken where quite apart from great losses, the guns will be exposed to risk of capture if the position be vacated. On the other hand should the artillery remain further to the rear, it cannot take part in the decisive moment of the attack.

The approaches to, and technical strengthening of, artillery positions were most carefully arranged; especially the masking of these, even when lack of time or difficult ground allowed of only temporary positions The distance over which artillery is to advance under fire into action must be minimised; on this account the occupation and change of positions was generally carried out by night; if by day the fire stricken zone was traversed at top speed.

The accuracy of the Russian gun and its effectiveness obliged the Japanese to resort to overhead cover and indirect fire. In many positions the Japanese prepared pits for both direct and indirect fire.

Locating the targets in many cases proved most difficult, since all were so well masked and Russian batteries unless their positions had been revealed by spies, were only betrayed by the reports or flashes, or by the clouds of dust.

Ranging was carried out by establishing brackets; percussion shrapnel being generally used, in difficult cases common. The Russians almost invariably began with time shrapnel and then went to percussion.

The Japanese fully recognised the importance of accurate fire observation and carefully trained personnel; they were provided with excellent glasses and telescopes.

As a rule shrapnel was employed against living targets, common shell against cover; against Artillery both kinds. Even when two batteries were firing simultaneously at the same target the Japanese preferred to fire both kinds to facilitate observation; they also considered that greater moral effect was also wrought thereby.

The Japanese Artillery was thoroughly satisfied with its shrapnel, yet the fuze only allowed of a range of 4400 yards; at greater ranges common shell had to be used, when field guns went to high angle fire. The Russian shrapnel owing to faulty fuze construction, burst irregularly: according to Japanese Officers' testimony shrapnel bursting more than 100 yards in front of the target produced no effect.

The small range of the Japanese guns and the extensive recourse to field fortifications by the Russians caused a much larger use of common shell by the Japanese than would be normally the case in a European war; the proportion carried was as one shrapnel to one common. Col. Matsumoto, Artillery Commander of the I. Army, gives it as his opinion that the proportion should be as 115 to 15 respectively, provided that the fuzes were made longer and available for longer ranges.

The Japanese generally employed battery fire, and only went to rapid fire on especially favourable occasions. The Russians shot by half battery salvoes with

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relatively long intervals; the Japanese made great use of this in order to escape from the effects of the Russian fire: their observers, warned by the flashes of the salvoes, made a single signal to the detachments who then immediately sought cover where they remained until the Russian shrapnel exploded, they were then safe until the next salvo.

In the initial stages of the war the Japanese made extensive use of sweeping fire to search out any positions in which the enemy was suspected to be; but the results achieved were found to be out of all proportion to the expenditure of ammunition, and very sparing recourse was therefore had to this method of fire later on; part of the battery would sometimes range on the foremost trenches while the remainder of the battery fired at ranges increased by 50 yards to 100 yards. The fire tactics by the higher Artillery commanders—of brigades and regiments—were principally confined to the indicating of targets: observation, choice of method and rate of fire were left entirely to the Battery Commander the higher commanders only interfered when mistakes were noticed. The larger artillery units were connected telephonically or telegraphically with the higher commanders; when equipped with telephonic apparatus of their own, Artillery regiment commanders opened up communications with divisional and battery commanders; sometimes flags were used to pass down observations also mounted and dismounted orderlies or a chain of men at 20—30 paces interval.

Optical means of communication were found better than either telephone or telegraph since these latter were so subject to interruption the nearer the enemy they were taken.

The normal amount of ammunition carried by the Japanese Artillery =400 rounds, 130 in the battery proved sufficient; but difficulties were experienced in getting up the ammunition columns, when communications were bad. At Mukden, the average expenditure per field battery was 250 rounds, mountain battery 200 per gun; but one battery fired 1200 rounds in less than 6 hours; while on the Sha-ho two guns fired 800 rounds in one day.

The Japanese strongly insisted upon the principle that the chief mission of the Artillery was to support the infantry: consequently it was its task (*a*) to make it as difficult as possible for the hostile guns to fire on the infantry, (*b*) to keep the enemy's infantry under fire.

(*a*). Is especially imporant for the attacker since the advancing infantry coming under fire has considerably more to suffer from artillery fire than the defending infantry under cover.

(*b*). Concerns the defender most nearly, for the Artillery in the first line of the infantry attack must halt here under fire without allowing itself to engage with the hostile guns.

It is most desirable for the attacking artillery to completely overwhelm the defenders fire, so that it may itself be free to devote its fire to the hostile infantry; this can only be attained by high angle fire. Experience in the recent war has shown that it is impossible for field guns to silence a well covered, even if weak, artillery for any length of time, since this latter is always in a position to withdraw from a fight unfavourable to itself. If then the fire of the attacking artillery, which proves itself too strong and obliges the adversary to take cover, becomes too dangerous for the infantry of the defence, the momentarily silent artillery of the defence renews its fire with unabated strength and compels the attacker to transfer his fire from the infantry to the attempted overwhelming of the guns once more. Even a weak artillery will intervene regardless, if firing upon the hostile infantry is of more importance than the maintenance of the battery's full strength.

It was only after the Japanese Artillery had obtained the mastery of fire that the majority of the batteries directed their fire against the hostile infantry; even then part of their artillery still engaged the guns. If they were weaker from an Artillery point of view, they confined themselves to firing at the guns only in moments of necessity. As the Russians invariably avoided a decisive combat with a superior foe, the long Artillery duel hardly ever took place; it was noticed on the contrary how batteries well concealed behind cover watched for the fleeting moment to open a concentrated fire upon a favourable target, then again to retire behind cover. Even the continuous bombardment of well chosen positions by field guns led to no decisive results, at the best the attack may be supported as the defender immediately before and during the decisive advance of the infantry may be hindered and his fire kept down. In accordance with this, short sharp bursts of artillery fire of great intensity should characterise the Artillery battle of the future; a method of action which calls for high qualities in Artillery commanders, together with a complete mastery of fire technique and not only decision but thorough tactical training.

The fire of Artillery will always be delayed to the last minute in the infantry attack, even if its own infantry be thereby endangered.

A Japanese General of high rank delivered himself of the following:—

"The Artillery before anything else in "the attack must prevent the enemy "firing upon its own infantry, and it is "only when the hostile guns are silenced "that fire may be opened upon the "enemy's infantry. Should it not succeed in keeping down the defender's "Artillery, it should still not direct its "fire upon the infantry, if its own infantry had already started; in this case "the defending infantry should be under "fire at the very last moment of the attack. Should the Artillery attempt to "fire on the defender's infantry before "his Artillery is subdued, the latter will "be free to fire on the advancing infant-

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" ry. It is impossible to beat down a " well covered Artillery with shrapnel; " high angle fire is essential. Whether " high angle fire especially from how- " itzers will be quick enough to seize " fleeting opportunities in a European " war remains to be seen. Artillery in " the open will be annihilated by guns " under cover. Batteries attacking the " flank produce little material effect, but " so great is the moral effect upon in- " fantry that they are brought to a " standstill. In such cases a company " must be detailed to get within 1000 " yards of the Artillery and silence it " cost what it may."

Whether Artillery, for the accomplishment of its mission, will be massed in large numbers or broken up into small units, the Japanese are not agreed. The latter gives simplicity of control of fire; but with larger bodies fire may be directed from two directions on to the same target and flanking effect rendered possible, it causes the enemy to divide his fire, there is no more choice and moreover fire can still be continued even if a brigade or so is put out of action. Of special importance is the possibility of flanking fire effect since the silencing of a well covered artillery by frontal low trajectory fire is almost impossible.

The small physical effect of Artillery fire on the Russian side may be set down partly to technical defects in the guns and ammunition, ignorance and want of training of the personnel with the newly issued equipment; but a great deal must be attributed to the fact that fire was generally at such long range and that both observation and effect were greatly intertered with in addition to which by skilful use of ground and provision of cover, by suitable formations and movements the effects of the hostile Artillery was greatly diminished. The moral effect great at first, decreased later when the small actual results became known.

A rather ingenious shield for guns was improvised, made of two boards of hard wood hinged together and of size sufficient to fill up the space between the wheels in front of the gun, over which it fitted; the top board was made to rest upon the tops of the axletree seat backs, on the seats were placed sacks of corn or other grain. After an action shrapnel bullets were constantly found embedded in these boards; they possessed the drawback of preventing rapid relaying of the gun.

The Japanese favour guns of the largest calibre for Heavy Artillery, confirmed by their experiences on the Sha-ho; where on the one side the protracted operations allowed time for the construction, and on the other the frozen ground allowed of the employment of heavy calibre guns, but these conditions will not ordinarily obtain in European warfare.

The I. Army had 4.8" guns, 6" howitzers and 3.6" mortars in action on the Sha-ho, which were especially detailed to keep down the hostile Artillery fire; the 4.8" guns also assisted the field guns against troops not under cover; and when two batteries were firing at the same target, mortar or howitzer fire was often combined with that of the guns; but never mortars with howitzers. The result did not entirely justify expectations, the small effect of the Heavy Artillery is ascribed to the fact that long usage had worn out the guns, and thereby impaired their accuracy. The Japanese found the 15 cm. (6") howitzers perfectly mobile with 6-horse teams and were able to keep up with the rest of the XII division round Mukden. The mortars also carried on wagons, were always to hand, but practically no use was made of either.

Mountain Artillery played a special part with the I. Army which was chiefly engaged in hilly country. It was ever prepared to follow the infantry movements, and could always be brought into action and to advance within short range of the enemy, so that it was always able to successfully engage the much longer ranging Russian guns, not only among the mountains, but in undulating country and even on the plain, the Mountain Artillery was able to avail itself of the slightest cover, could approach nearer the enemy and more easily accompany the infantry attack than the Field Artillery, which was compelled to unlimber at longer range and only under exceptionally favourable configurations of ground could take up a new position in advance. This considerable advantage of adapting itself to the conformation of the ground would have been of still greater use had not the guns' small range discounted it when closer approach to the enemy was impossible.

The Japanese attempted to make up for their lack of Horse Artillery by improvising batteries with teams of selected horses and making the guns as light as possible.

Progress of foreign armies in 1906.
Germany.—France.—Balkan States.

The Swiss field kitchen wagon.

Notes on foreign armies.

Naval news.—Submarines.

Technical intelligence.

Supply and medical matters.

July, 1907.

The annexation of Dalmatia; by Col. A. Grunzweig v. Eichensieg.

The training of skirmishers, section leaders and company commanders; by Col. E. v. Horsetzky.

Motor water transports for the pioneers.

The causes of the Russian defeats, according to General Martynow.

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The Amur railway (with map).

Foreign military intelligence.
Balkan States. — Belgium. — France.— Italy.—Russia.—Japan.

Naval news.—French submarines.

Technical intelligence.
Apparatus for setting out the line of fire by night.

A new Austrian disappearing target—liquid air as an explosive.

On the siege howitzers' sphere of action.

A new arm of the service has now made its appearance in the armies of nations; Heavy Artillery has now been made mobile, as is the Field Artillery, in order under certain circumstances to increase the latter's effect. For the most part howitzers of 15 cm. (6″) bore are considered suitable; only Germany and Russia have rendered their 8·4 inch mortars mobile. 12 to 16 of these pieces are allowed to each army corps; but the various powers are by no means agreed as to which branch of the Artillery this ordnance should belong.

Several of the smaller states as Switzerland, Scandinavia, &c., have position Artillery, intermediate between Field and Garrison Artillery, but partaking more of the nature of Siege Artillery.

England, Germany, Japan, France, Austria Hungary have allotted these guns to the Garrison Artillery. As there seems to be a certain amount of doubt as to which branch these siege guns and their teams should belong, it may be of interest to enquire into reasons.

As regards their tactical use.

In the field these heavy guns are only employed against very strong field fortifications, partaking more of siege operations than an engagement in the field; it is therefore only logical that that branch which is called upon to undertake siege operations, should be entrusted with similar tasks in the field. Teams are given them so that they may act as the advanced guard and mobile part of Siege Artillery. The German Emperor calls them the fourth branch of his army; they are organised in battalions so as to indicate that though belonging to the field army they remain foot Artillery.

In fortress warfare, these howitzers will fight side by side with the rest of the Heavy Artillery.

In every respect as regards the tactical employment of siege howitzers it is most desirable that they should form part of the Garrison Artillery.

As regards training.

The mere fact of siege howitzers being horsed does not afford an argument for their allotment to the Field Artillery; but on the contrary gives the Garrison Artilleryman an opportunity of enlarging his knowledge; speed and mobility are not of special importance as with field guns. It is not the fact of having teams to the guns which distinguishes Field from Garrison; methods of transport and taking up a position—quite apart from fire effect—are totally distinct in the two branches.

The difficulty in using these guns in concealed positions would only handicap their training with Field Artillery, this should therefore be carried out by the Garrison Artillery whose foster children they then become, thanks to their mobility; with the Field Artillery they would not prosper and perhaps deteriorate; to the Field Artillery they would act as a drag while to the Garrison Artillery they prove a stimulus, besides affording the Garrison Artillery officer the chance of being taught to ride, giving him change of scene from a fortress and encouraging him to train his eye for country.

From the point of view of completing cadres the allotment of these heavy batteries to the Garrison Artillery is desirable. Captain Adler.

August, 1907.

Lieut. Field Marshal Anton v. Winzor, Comdg. 15th (Austro-Hung.) Army Corps, &c., &c. (With portrait).

The annexation of Dalmatia (continued); by Col. A. G. v. Eichensieg (retired list.)

Umpires; by Capt. M. Ronge of the General Staff Corps.

On training skirmishers, section leaders and company commanders (continued); by Col. E. v. Horsetzky.

The inspection of musketry practice.

The two Great Powers (U.S.A. & Japan) in the Pacific Ocean. A short review of the resources of both nations called forth by the strained relations between them. By F. Schw.

Notes on Foreign Armies.

ROUMANIA. Proposed Army reform. The formation of 18 three-battalion regiments. The cadres of 34 battalions already exist.

FRANCE. The military budget for the coming year amounts to 777,025,836f. about £31,081,033; decrease of £118,412 on the current year.

A new agreement with Siam defining frontiers of Indo-China and improving their mutual relations.

RUSSIA. Court-martial sentences.

Naval intelligence.
The universal increase of battle-ship displacement.
The Japanese Navy.
France is to spend £12,876,911 on her Navy in 1908, an increase of £390,118 over 1907.

The U.S.A. have obtained the consent of Mexico for the creation of coaling station in Magdalena Bay, one of the best harbours in the world for a naval base.

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Technical intelligence.

A new patent ammunition carrier.

Each round fits into a rubber covered ring, the head of the shell is protected by a cap which is so constructed that the top of the fuze is nowhere in contact but kept free of dust: the rounds can sustain any amount of knocking about without injury, thanks to the rubber linings.

The Brennan gyroscopic monorail.

Widening of the Kiel canal; the bottom is to be increased from 22 to 44 metres (72 feet to 144 feet) whereby the water surface will then be 333¾ feet wide while the depth will be increased from 29½ to 36 feet. About 18,000 ships pass through yearly of a registered tonnage of 5½ millions; but even in 1905 33,147 ships of tonnage 5 8 millions made use of it. The increased width will allow of two large and three small vessels passing each other.

September, 1907.

The annexation of Dalmatia; by Col. A. G. v. Eichensieg, on the retired list. (To be concluded).

The practising of all arms in certain situations of the fight; by Lt.-Col. J. Schön.

The battle of Wafang Kou; by Capt. M. v. Pitreich of the General Staff Corps.

What happened on the Russian side.

What happened on the Japanese side.

On the use of automobiles with siege howitzers.

On the march and in action the brigade is divided into—

1. The fighting batteries.
2. The combined second line of battery wagons.
3. The brigade ammunition park.
4. The train.

And all this covers a great amount of ground.

1. Includes guns and first line of wagons, carries one fifth of the total ammunition.

2. Acts as first reserve to 1 for ammunition and men, and must be always ready to make up deficiencies in the first line; in it is carried two fifths of the total ammunition supply.

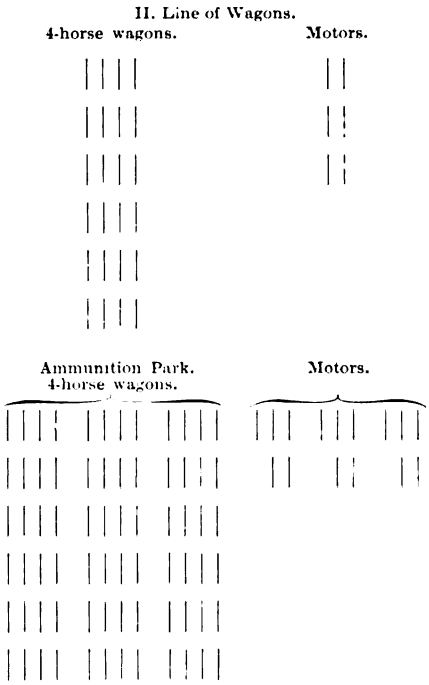
3. Carries the remainder of the ammunition; it can hardly be counted on for the first day.

The proportion of personnel and horses to matériel in the fighting battery with regard solely to marching and fighting requirements, is a standard one; it should therefore remain untouched. But in the second line conditions are different and replenishment and transport questions become of primary importance. For the Park, proportion of transport only is in question.

The proportion of horses in these two lines works out at one horse to every 5 rounds.

Up till now this proportion was justified; the draught power per horse, the carrying capacity and tare of the wagons rendered them necessary. Now conditions are changed with the advent of the automobile, and their proved suitability for military uses.

The ammunition of the combined second line of wagons can be carried by 6 mechanical wagons, instead of 24 with horses; and the whole of the ammunition park by 15 instead of 72; or graphically represented and compared as below.



The advantages gained thereby in wartime are beyond all question. Siege Artillery will always advance along roads already prepared; it has little call for great mobility and its sphere of action will not be far removed from roads, tho' the last short advance may have to be across country off the road. It is by no means necessary to have all parts of the battery interchangeable; the fighting battery may well be different to the ammunition vehicles. The former should be able to get over country, and ploughed land should be the normal gun platform; but a wagon travelling backwards and forwards between gun and wagon line should suffice, the motors being stationed on a suitable spot on or near practicable roads.

If the II. line is placed 1,000 yards behind the guns, the replenishment of ammunition in the battery can be carried out in about ½ hour; it would scarcely be

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possible to exhaust the I. line ammunition in this time. Very often the automobiles of the II. line would be able to come right into the battery; in this case the I. and II. lines would simply change places.

How important it will be in the future to pass over ground which is visible to the enemy as quickly as possible, and to expose as few living targets on ground under the enemy's fire, has been amply proved by events in the late war. So much for the II. line.

The present park as constituted is a long cumbersome column and its efficiency leaves something to be desired.

As an automobile train the park could cover several marches in one day; wagons would not have to be requisitioned and ammunition would be a shorter time on the road.

Besides reducing the length of the column, no inconsiderable quantity of rations would be saved. Before and during an engagement, the rapid advance of the ammunition park and its connection with the II. wagon line would facilitate smooth working of the battery.

From an economic standpoint many advantages are offered: the saving in horses would pay for the greater part of the automobiles; and the vehicles thus set free used for other purposes.

In garrison these motor trains would be of the greatest use in relieving the teams of other units of transport work, and thereby also train a staff for their duties in war.

A motor vehicle of enormous use to a battery would be a gun store wagon, in which were combined speed with carrying capacity; as soon as reconnaissance had been completed this vehicle would be hurried forward with the necessary tools to prepare the position selected; these positions made ready beforehand will be the rule. This wagon will have a total weight of 2008k. (39 cwt.) which makes 502k. (10 cwt.) per horse.

The following additional stores might be carried in the future—telephonic apparatus, wide tyres for the wheels, tents, and of great utility light bridging material for crossing ditches, &c., so that not only itself but the whole column may be more easily diverted from the road; to turn in a certain space is necessary, and it often means marching on for a mile or two until a suitable spot can be found for this, and thus progress is delayed which at times might be critical. A thousand more uses might be urged in favour of its introduction.

In course of time horse transport must give way more and more to mechanical; should we not therefore take time by the forelock and anticipate a little? Much will be gained by its adoption.

On technical training for French infantry troops; by Major v. Mierka.

The Russo-Japanese war. Opinions and observations of those who took part in it.

Commissariat and field post office in the I. Japanese army in the campaign against Russia.

Blowing up a Japanese railway bridge to the S. of Haitschon on 21 Feb., 1905. By Major A. v. Dàni.

The manœuvres in China in 1906 (with 3 sketch maps); by D.H.

Foreign military intelligence.

FRANCE. Relieving Gen. Hagron of his command.

The 12 and 18 Army corps on manœuvres are to have motor T. and S. columns.

GREAT BRITAIN. The 1907 Cavalry manœuvres in Scotland.

ITALY. New scale of pay and pensions for officers.

RUSSIA. Committee for the re-organisation of coast defence.

JAPAN. To each of the 18 divisions is to be allotted a Field Artillery regiment of two brigades each of 3 batteries. There are 6 guns per battery.

The 2nd., 17th., and 18th., divisions will include a Mountain Artillery brigade of three 6-gun batteries.

The Field Artillery will shortly be issued with the new non-recoil Medji gun. 1,100 have already been ordered from Krupp. The re-armament will be complete by manœuvre time.

A new Heavy Artillery is to be created out of the Garrison and Heavy Artillery improvised during the war. It is to be organised as mobile Heavy Artillery and stationary, really Garrison Artillery. The former will comprise 6 regiments, armed with 12 and 15 cm. (4·72 and 5·9 inch) howitzers and 10·5 cm. (4·14 inch) guns.

Trials with Artillery fire against balloons have been carried out.

Naval news.

An automatic safety release arrangement for mines.

Tonnage and weight of metal fired from guns.

Country.	Tonnage.	Weight of metal.
England	1,744,900	468,963 lb.
France	924,880	219,589 „
U.S.A.	756,900	393,248 „
Germany	672,770	169,235 „
Japan	451,435	144,089 „
Russia	399,090	110,268 „
Italy	336,850	121,011 „
Austro-Hungary ...	126,104	41,738 „

Dividing sum total weight of projectiles by the sum of the displacement $\frac{\Sigma P}{\Sigma t}$ gives:

England 0·88, France 0·78, U.S.A. 1·72, Germany 0·85, Japan 1·06, Russia 0·74, Italy 1·19, Austro-Hungary 1·09; these results are rather astonishing.

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Technical notes.
A new rifle cartridge.
An improved fuze for hand grenades.
The French canoe-motor car.—Revailler.

Military publications.
"Distribution of Fire with Garrison Artillery"; by Capt. W. Knobloch. Published by Seidel & Son, Vienna.

"The development of the non-recoil field howitzer"; by Maj.-Gen. Bahn. Published by Bath, Berlin. A well written and instructive book.

Revue Militaire des Armées Étrangères.

Précis of Contents.

By CAPTAIN F. A. BUZZARD, R.F.A.

August, 1907.

1. The new German "Field Artillery Training."

An interesting article, but the subject has already been reviewed in the R.A. Journal.

2. The German Army and Navy estimates (War Budget) for 1907.

3. The new Transport organisation of the Russian army.

The principal change is the introduction of pair horse instead of four horsed vehicles for the bulk of the wheeled transport.

As regards supplies, 12 days of biscuit are now carried with an army Corps instead of 8 as formerly, whilst preserved meat and preserved vegetables are carried in the proportion of 4 days rations of the former and 7 of the latter, whereas no meat or vegetable ration was formerly carried.

Each squadron, company, and battery, will have a field kitchen with its transport.

4. Foreign Military notes.

The German army has adopted the method of fastening up horses in bivouacs which is now generally employed in England. Ropes are stretched from limber wheel to limber wheel and similarly between the inward wheels of guns or wagon bodies. If necessary one picket is used at the centre of each rope to hold it up. Horses face inwards.

September, 1907.

1. The Russo-Japanese War.

This is the first instalment of what promises to be a carefully written treatise of some length upon the war in question. It does not, however, aim at being a complete history of the war, but, in the words of the author, "Merely to give a fair account of the campaign and to indicate in what respects it differed from an European war."

2. Austria and the Italian Frontier (to be continued).

3. The new German "Field Artillery Training" (continued).

This instalment deals with the tactical employment of Field Artillery and discusses the views expressed in the German text book on such points as "The advantages and disadvantges of Covered Positions," etc.

4. Foreign Military notes.

These contain little of Artillery interest.

N.B. (No. 3 is very well worth reading. I have not attempted to translate it or give a full precis, as the subject has been dealt with already).

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"Les Spectateur Militaire."

Précis of Contents.

By MAJOR E. P. SMITH, R.F.A.

15th August, 1907.

Exercises in field service for officers.

Appendix.—

Third example. An exercise in frontier warfare.

Fourth example. An exercise in the selection and control of halting-places.

Fifth example. An exercise in outposts.

Sixth example. Flank guards. Bridge building.

Seventh example. An Infantry officer operating against a fortified position.

Eighth example. An exercise in fortress warfare at night.

Electric automatic targets. (The Bremer system).

The Channel Tunnel. Its relation to the safety of France and Great Britain.

An International Garrison.

Chapter VI. Curiosities. At the "Thousand Curiosities" shop. The Spitzer road. The market. Antiquities. The Popes.

Chapter VII. Umezzins, Dervishes, and Mosques.

1st September, 1907.

Exercises in field services for officers. Maps and reports.

Russo-Japanese War.

The Petrowsky regiment on the Pontiloff Hill. Souvenirs of a battalion commander. Preliminaries. Mobilization. Exercises. Departure. Arrival at Mukden. General Kuropatkin visits the bivouac. The march and camp on the banks of the Kun-Ho. Field works. Bivouac near the village of Tawa.

The Channel Tunnel. Its relations to the security of France and Great Britain.

Chapter V.

An International Garrison.

Chapter VIII. Fêtes and ceremonies.

Chapter IX. The Turkish woman.

15th September, 1907.

Russo-Japanese war.

The Petrowsky regiment on the Pontiloff Hill. Souvenirs of a battalion commander.

The Channel Tunnel.

Its relations to the safety of France and Great Britain.

Chapter VI. The English army of today.

Its superiority over Continental armies in warding off a danger supposed to be created by the Channel Tunnel.

The uselessness and danger of re-modelling it (the English army) on the Continental type.

The tunnel, as projected, is at the mercy of fleets.

Military Expenses.

Uselessness of constructing a first class fortress at Dover.

A remarkable idea of the Duke of Cambridge.

The tunnel has no value as a military instrument against Great Britain.

Study of the different systems of military colonisation, practised in France and abroad.

Roman Colonisation.

An International Garrison.

Chapter X. The Palikares.

Chapter XI. Some rural economy.

1st October, 1907.

The Petrowsky regiment on the Pontiloff Hill. Souvenirs of a battalion commander.

The Channel Tunnel.

Chapter VII. Sentiment. The silver streak interest. Paine. If England came to be conquered! The great scarecrow of the retention of Dover by the conqueror. England's vanity.

General Yusuf.

Biographical notes. Appendices.

Study of the different systems of military colonisation tried in France and abroad.

Military colonies of Austro-Hungary.

Review of books.

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The New Italian Field Artillery Equipment.

Translated from " Neue Militärische Blätter."

No. 12, of September 15th, 1907.

By CAPTAIN F. A. BUZZARD, R.F.A.

ACCORDING to the Austrian Technical Press (*The Vedette*) it appears that the report of the Committee appointed as a result of the debate upon the Italian Army Estimates for 1907-08, gives the following account of the new Field Artillery material.

This gun (75 millimetre Krupp model 1906) has a muzzle velocity superior to that of any field gun adopted in other countries with the exception of the French gun. The latter is heavier, however, and for other reasons inferior. Moreover it is pointed out that it was out of the question to seek increased power by making the Italian gun heavier, on account of the limited number of horses suitable for heavy draught which would be available in Italy on mobilization.

The Italian shrapnel holds more bullets than that of any other field gun except the Belgian 75 millimetre and the English 18 Pr.

At the moment of burst the bullets receive a velocity which gives a striking energy of 20 kilogram-metres.

The gun is sighted to fire up to 6,800 metres and the extreme range for time shrapnel is 6,000 metres.

It is said that increased importance is being attached to common shell loaded with Picric acid for use against shielded guns. The rate of fire is very high.

The operation of laying the gun has been made as simple as possible by the introduction of various expedients, such as the Panorama Telescopic sight, which enables laying to be carried out from behind the shield.

In spite of the small weight of the gun, its stability on firing is said to be at least as good as that of any of its rivals, this result having been obtained by the most careful adjustment of the arrangements for checking the recoil and running up the gun into the firing position.

By the use of improved steel, it has been found possible to have the shields as thin as 4 millimetres whilst making them at the same time proof against rifle bullets at a range of 200 metres.

The introduction of lighter ammunition will facilitate the mobility of the equipment by allowing lighter ammunition wagons to be made.

The only point in which the new Italian gun appears to be inferior to those of Germany and Austria is its greater weight, but it is thought that the difference is not great enough to constitute any real disadvantage as regards moving the gun.

The introduction of the new gun calls for an increase in the amount of ammunition carried and consequently in the number of horses necessary. The number of guns per battery will be reduced from six to four, but there will still be 96 field guns to each Army Corps, to which, in some cases, mountain batteries would be added.

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Militär-Wochenblatt, 1907.

ARTICLES OF ARTILLERY INTEREST.

No. 84, 4th July. On the article "The change of target by Field Artillery when in concealed positions."

No. 87, 11th July. The measurement of the angle of sight in partially concealed positions.

No. 88, 13th July. The limits of firing from concealed positions for the field gun. [Good. J.F.C.].

No. 90, 18th July. Comparative range finding.

No. 93, 25th July. On the tactics of siege warfare.

No. 94, 27th July. The new Field Artillery Training.

The measurement of displacement when changing target with field artillery in concealed positions.

No. 98, 6th August. Indirect rifle fire from concealed positions.

No. 99, 8th August. Number and space in the employment of artillery (important).

No. 102, 15th August. The artillery fight from concealed positions.

No. 105. Riding and driving schools for Field Artillery.

Nos. 105, 106, and 107. A word on the conflict about whole and half concealed positions for Field Artillery. (A full consideration of the subject).

No. 115, 12th September. Again the concealed artillery position. (Lieut. General H. Rohne).

No. 122, 24th September. Modern artillery positions, their characteristics and names.

No. 128, 8th October. More on "Modern artillery positions."

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Reports, Precis, Translations, Etc.

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VOL. XXXIV.

CONTENTS.

The supply of ammunition to Field Batteries; by I. Chubakov. Translated from the "Voenni Sbornik," April, 1907..... 281

The new Italian Field Artillery Equipment; by Commandant D. . . . Translated from the "Revue Militaire Générale," June, 1907. By 2nd-Lieut. H. W. Young, R.G.A.... 297

Rivista Marittima." Précis of contents. By Lieutenant J. R. Little, R.F.A. 298

"Revista di Artigleria e Genio." Précis of contents. By Lieutenant H. G. deWatteville, R.G.A. 299

"Revue de l'Armée Belge." Précis of contents. By Lieutenant K. B. Ferguson, R.G.A. 300

A few lessons for Artillery from the Russo-Japanese War. By Capitaine-Commandant A. Hellebaut. Précis from the "Revue de l'Armée Belge." By Lieut. K. B. Ferguson, R.G.A. 301

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DECEMBER, 1907.

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The supply of Ammunition to Field Batteries.

By I. CHUBAKOV.

Translated from the "Voenni Sbornik," April, 1907.

THE whole strength of artillery lies in its fire. The question of replacing the ammunition expended is, therefore, of the utmost importance.

Artillery without ammunition is impotent and useless. Napoleon said that "Artillery in action should never feel the lack of ammunition." In military history we hardly ever find a case of batteries, in the fighting line, having ammunition unexpended at the end of an action. There are, on the other hand, innumerable instances of the supply running short. In the Franco-German campaign of 1870-71, artillery frequently retired because its ammunition was exhausted. There are also instances when the men of batteries, which had expended all their ammunition, sat upon the limbers, and while waiting for fresh ammunition to come up, sang "Die Wacht am Rein."

The expenditure of ammunition in individual actions, and also in the course of whole campaigns, has varied to an extraordinary extent. But, until the recent Russo-Japanese war, it has never been so great as in the Franco-German campaign of 1870-71. The Germans expended on an average per gun (exclusive of reserve batteries):—

Prussian artillery	209	rounds.
Bavarian „	216	„
Saxon „	162	„

For our purposes, the number of rounds expended in individual actions are specially instructive.

At Vionville	88·5	rounds were	expended	per gun.
„ Gravelotte	55	do.	do.	do.
„ Sedan	57	do.	do.	do
„ Noiseville (2 days)	74	do.	do.	do.

The average expenditure of ammunition per battery in individual actions amounted to 421 rounds, the maximum expenditure being 761 rounds. The average expenditure of a battery per hour was 85 rounds, while the maximum amounted to 127·3 rounds per hour.

In the Russo-Turkish war of 1877-78, the expenditure of ammunition was not great. The 9-pr. batteries fired 200 rounds per gun, and the 4-pr. batteries about 120 rounds. This is explained by the fact that the employment of field artillery was restricted by the circumstances that the war was, to a large extent, one of positions.

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As regards more recent wars, the Greeko-Turkish, Spanish-American, Chino-Japanese, and the Boer war, no detailed information is available, and, moreover, those wars were carried on under exceptional circumstances.

Still, there were indications from which it was possible to foresee a great expenditure of ammunition. In the Sudan expedition of 1898, at the battle of Omderman, on the 2nd September, during an action lasting 2½ hours, the average expenditure of the British batteries amounted to 500 rounds, or almost exactly the same as that of the German batteries at Vionville, but in a quarter of the time. And here, it should be noted, that there was no question of an artillery duel—the enemy only had a few guns which hardly took any part at all in the action.

There is no doubt that with the improvement of artillery, the expenditure of ammunition in future will be greater than ever. The recent war with Japan has already supplied an authoritative answer on this point; but in view of the fact that false conclusions have sometimes been drawn from war experiences, it will be well to mention here the considerations from which it might have been inferred —so to say theoretically—even before the war, that the expenditure of ammunition would show a considerable increase as compared with the past.

Many people asserted that there was no reason to anticipate any large increase in the expenditure of ammunition, because the improvement of artillery led to the desired results being obtained in less time, and consequently to a reduction in the expenditure of ammunition. Fire, they said, directed upon well masked, concealed or invulnerable objects leads to a waste of ammunition; when once this has been realised, such targets will not be fired at; while if the object be vulnerable, a comparatively small number of rounds will be required in view of the increased fire effect of modern artillery.

This line of argument would have been entirely correct if there had not been many other factors which told in the opposite direction.

1. The immediate result of the improvement of firearms has been the use of increased ranges. Consequently the infantry attack is commenced at longer ranges, and more time is occupied in carrying it out; which in turn implies a greater expenditure of ammunition.

2. The enormously increased power of artillery fire compels the utmost use being made of cover; thus the visibility and vulnerability of objects is reduced. The development of the means by which artillery can make use of covered positions, leads to the bombardment of large areas—i.e., to an increased expenditure in ammunition. The Japanese on the Sha Ho bombarded for four days what they believed to be the position occupied by certain Russian batteries; but the result was nil, as the Russian batteries had changed their positions.

3. The masses of troops, launched one after another, and the enormous size of modern armies, prolong the duration of actions to an extent which we cannot yet foresee. In the Franco-German war the longest battle lasted three days; nowadays we see battles lasting

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a fortnight, with desperate fighting for from twelve to fifteen hours a day. Such prolonged actions lead to an enormous expenditure of ammunition, in spite of every effort to economise it.

4. With the introduction of shields in the artillery, the vulnerable target offered by guns, has been reduced to from one-fifth to one-tenth of its former dimensions. Therefore, in order to obtain the same results, it is necessary, theoretically, to fire 5—10 times the number of rounds.

5. The vitality of artillery is increased. In order to silence artillery a heavy and prolonged fire is necessary, because one man alone can now fire a gun. The shield, by increasing the power of resistance against fire, makes it necessary to shell the enemy's artillery more heavily than ever.

6. The rapidity of fire having increased, it is impossible to guarantee that there shall be no waste, or to expend the ammunition with strict economy.

All these considerations lead to the belief that the expenditure of ammunition will be very great. The amounts expended during the Franco-German war can only be considered as approximations, for the purpose of estimating the expenditure of the future. The German artillery constantly suffered from lack of ammunition, and did not expend more because there was none to expend.

Moreover, throughout the whole campaign, the Germans never once had to sustain a serious artillery duel, while the French infantry almost always confined themselves to passive defence.

General Langlois considers it necessary to have not less than 100 rounds per battery per hour, i.e., for an action lasting 3-4 days, (reckoning eight hours to a day), 3,000 rounds per battery, or 500 rounds per gun.

These calculations were, apparently, taken as a basis in fixing the allowance of ammunition for the French Q.F. batteries.

Up to the recent Russo-Japanese war, the supply of ammunition (first line and army corps reserves) did not exceed 400 rounds per gun in any of the more important European armies, with the exception of France, which brought this figure up to 500 rounds. The experience of the recent campaign has demonstrated how well advised the French were in increasing the ammunition supply of their batteries.

During the recent campaign the greatest expenditure of ammunition by a battery in one day was 4,178 rounds; the average expenditure, in the 1st and 3rd Siberian Army Corps, in the battle of Liao-Yang, on the 30th and 31st August, amounting to 3,375 rounds. In the Franco-German campaign, the highest average expenditure per battery in one day occurred in the 3rd Corps at the battle of Vionville, and amounted to 769 rounds only, or between one-fourth and one-fifth of the Russian expenditure just mentioned.

It is true that data concerning the recent war can only be of relative value in view of the fact that they have not yet been fully collated and sifted, but still it may be stated that the average expenditure of ammunition by a battery in one day amounts to 2,000

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rounds,[1] and in one hour to 200 rounds. The 2nd battery 9th East Siberian Artillery Brigade fired 4,178 rounds in a day, but this figure cannot be taken as a basis for calculation, as such an expenditure is apparently exceptional.

General Langlois considered it necessary for a battery to have 800 rounds per day. The present day expenditure of ammunition, therefore, exceeds his estimate by 250 per cent.

It will not be without interest to mention here the amount of artillery ammunition expended by the Russians in some of the more important actions of the recent war, viz:—

At Wa-fang-kou	10,000	rounds were expended.
„ Ta-shih-chiao	22,000	„ „ „
„ Liao-yang	116,000	„ „ „
„ Sha Ho	160,000	„ „ „
„ Shen-tan-pu	70,000	„ „ „
„ Mukden	290,000	„ (of which 40,000 were captured by the enemy).

The total expenditure of ammunition by the Russians during the course of the whole campaign, amounted to:—

Artillery	954,000	rounds.
Small arms	174,000,000	„ (of which 15,000,000 rounds were captured by the enemy).

From these figures it may legitimately be inferred that the expenditure of ammunition will, in future, be so great as to exceed all previous calculations. The question arises, how is this state of affairs to be dealt with, and how is the insatiable maw of Q.F. guns to be filled? First of all the artillery demand for a very large supply of ammunition must be met, and then all possible measures must be taken to keep the expenditure within the bounds of reasonable economy.

Against the latter principle the Russians sinned greatly during the recent campaign. Perhaps the greatest fault lay in the prolonged bombardments, barren of all results, which were carried on for days together without any co-operation from the infantry. Here, the Russians repeated the same mistake made at Plevna. The losses inflicted upon the enemy were very small, because it was easy for him to conceal himself from artillery fire. The preparation and attack ought not to be two separate and distinct operations, but should be carried out simultaneously and concurrently. Artillery fires when stationary, whereas infantry can fire usefully and economically while advancing. Nowadays, close co-operation between infantry and artillery is more essential than ever. "War is made by skill, not by numbers" (Suvorov). "The greatest strength, if applied in detail, can achieve no good result, either in the artillery or in the

[1] At the Yang-tzu Ling, 3/31 fired 1,292 rounds in a day.
At Ta-shih-chiao, 15th July, 3/1 E.S. brigade fired 1,992 rounds.
On the 6th August, 2/9 E.S. fired 4,178 rounds.
At Lioa-yang, on the 30th and 31st August, the 1st and 3rd Siberian Army Corps averaged 2,375 rounds per battery per day.
On the Sha Ho, the 35th Artillery brigade (36 guns) fired 2,015 rounds in one day, and 2,123 the following day.

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infantry, or in the cavalry, or in any branch whatever of military affairs" (Napoleon).

The distances at which artillery fire was opened were enormous, as much as 3½, 4, and even 4½ miles. At Wa-fang-kou the artillery duel was carried out at a range of 2½ miles; in the affair at Siu-ho-yen the artillery came into action at a distance of nearly 3½ miles; Colonel Slyusarenko's artillery, on the 12th October, also came into action at about the same range—3½ miles; at Ta-shih-chiao some batteries of the 1st E. S. Artillery Brigade, fired almost the whole time with percussion shrapnel. An artillery duel, at such ranges as these, can only result in an enormous expenditure of ammunition; and in the end, the artillery runs the risk of being short of rounds at the very time when it might inflict a decisive blow upon the enemy.

The most important phase of artillery action should begin at the ranges of decisive shrapnel fire (3,500 yards—4,600 yards), its power of long range fire being used on exceptional occasions. General Langlois, quoting a saying of Field Marshal Bugeaud, "fire at long ranges shows that the infantry is bad," adds "in the present day, the same may be said of artillery." Nearly thirty years ago, General Gurko, with the impressions of the Russo-Turkish campaign fresh in his mind, wrote in orders: "It is discreditable to come into action at long ranges without specially cogent reasons." Langlois considers that "fire should be opened at decisive ranges" (now about 4,200 yards).

Rounds were wasted in the recent war in shelling unimportant objects, such as a picquet, a small group of men doing entrenching work, "to frighten them a bit," for moral effect, and so on.

The fire action of modern artillery should take the form of sudden short bursts of heavy fire, alternating with intervals either of complete silence, or of very deliberate slow firing, to "hold" the enemy's artillery to his position. Artillery will fire for minutes, but be silent for hours. But even so, these short bursts of fire demand great exertion on the part of the artillery, and the expenditure of ammunition will be enormous. In this connection it must not be forgotten that the Q.F. gun is capable of firing off all the ammunition supply of a battery, in half an hour. This fact must be remembered, especially since men, under an ever growing tension and impressionability, will find themselves in even more trying circumstances in any future war. It is hard, when suffering losses and having the means of replying, to refrain from doing so with rapid fire. With the introduction of shields a battery will be able to work a little more comfortably, especially when it is in the open; to deny the possibility of guns having to take up such positions would be extremely short-sighted.

The supply of ammunition carried with the battery is so small that it is impossible to expect efficient action with the means available. Even if, by adopting suitable measures, it be possible to satisfy the requirements of an action, still at its conclusion the ammunition supply will inevitably be exhausted. For the purpose of replenishing the supply, there are organisations in rear, generally termed parks.

In all the most important European armies, three lines of parks

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are organized for the supply of ammunition.[1] The organization of parks and their method of action must be such that the parks shall be able to afford to batteries—from the very beginning of an action—a constant and inexhaustable flow of ammunition. This standard can only be attained if the parks are able to keep the battery wagons full of ammunition during a whole action, and whatever the rate of fire may be. It would, of course, be possible to achieve this by moving up the whole mass of wagons composing the park as close as possible to the fighting line. But this would be very inconvenient, and might be superfluous as a great expenditure of ammunition is not constantly proceeding. It is, therefore, better to organize the ammunition supply available, in echelons; and with this view as a force moves forward from the base (provided with ammunition from the national arsenals), only a portion of the wagons containing such ammunition would be also moved forward. As the force gets further away, another portion of the park would follow (at from ½ to 1 day's march) in rear of it, and would serve as a reserve to the first portion. As the advance continued, fresh portions of the park would be sent on, at the same distance apart, until it would become advisable to push forward the base itself (i.e., the initial point supplied from the home arsenals).

The organization of Russian artillery parks is far from uniform, and the supply of ammunition to the troops, from the wagons nearest to them is, therefore, very varied. During the recent campaign, the supply of ammunition available in the parks varied from 310 to 138 rounds per gun.[2]

The 3rd and 6th East Siberian Rifle Divisions had, in full park brigades (each composed of three parks), according to the new organization, 310 rounds per gun and 54 rounds per rifle. A park brigade is composed of three parks, each consisting of 18 pair-horse, two-wheeled ammunition carts and 36 ammunition wagons. In a park brigade on the new system there are, therefore, 108 ammunition wagons and 54 two-wheeled carts in all.

The 4th Siberian Army Corps had 260 rounds per gun (i.e., a park brigade of three parks of the new establishment, with an additional park), and a second supply of small arm ammunition.

The 1st and 5th East Siberian Rifle Divisions, to which park brigades of three parks of the old establishments (i.e., 48 ammunition wagons and 216 two-wheeled carts) were allotted, had 138 rounds per gun and 85 rounds per rifle.

The divisions of the 1st European Army Corps, and the 5th and 6th Siberian Army Corps had park brigades (composed of two parks) of the new establishment, carrying 138 rounds per gun and 36 rounds per rifle.

All the remaining divisions from European Russia had park

[1] Russia. Parks of the 1st and 2nd echelons, and local parks.
France. Park detachments, army corps parks and larger parks.
Germany. (a). Ammunition columns (b). ammunition columns and mobile columns of the army parks, and (c). Army parks.
Austria. Ammunition parks, army corps parks, and army parks.

[2] Report by the Chief Inspector of Artillery, on the Staff of the C.-in-C.

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brigades (of 3 parks) of the new establishment, carrying 200 rounds per gun and 54 rounds per rifle.

All mountain batteries had one park per battery, in which there were carried 120 rounds per gun.

The experience of the late war shows that these supplies were not sufficient. The Russians began the war with a supply of 600 rounds per gun, whereas at the close of the war 1,500 rounds were provided. The insufficiency of the supply carried by the parks is evident from the constant efforts made by the troops to collect special reserves of ammunition, in the positions occupied. Felt, as this insufficiency was during the late war, it would have been much more felt if the operations had been of an offensive character.

The first step to be taken would seem to be to increase the supply of ammunition carried by the battery itself, by giving it an additional ammunition wagon for each gun. One wagon should form an indivisible unit with each gun, while two other wagons will be in the battery reserve (i.e., in all 24 wagons). Thus there would be with the battery itself 300 rounds per gun.[1]

In France, where they have had Q.F. guns for a considerable time, and where more attention is paid to artillery questions of all kinds than in other countries, 312 rounds per gun are carried in three wagons and limber.

The battery reserves of a division, which are the only means at the disposal of its commander by which he exercises any control over the course of action, should be entirely in his hands; and the augmentation of these reserves, in view of the enormous expenditure of ammunition of the present day, can alone give the commander of a division sufficient independence and freedom of action. The depth of a division in column of route would only be increased by about 600 paces, which is certainly not too much, especially if the urgency of the question of ammunition supply be taken into consideration. As things stand at present it would be better to reduce the number of guns and provide more wagons, as rapidity of fire makes guns, however excellent in themselves, only a serious burden—if they are without ammunition.

It is desirable to have in the field parks the number of rounds which were available for the 3rd, 6th and 9th East Siberian Rifle Artillery Brigade (of four batteries)—i.e., 310 rounds per gun, which were carried in the brigades of three parks during the recent campaign. Then for an artillery brigade of six batteries, the park brigade (of three parks) would have 52 wagons per park.[2] But this number is not a satisfactory one for purposes of sub-division. Parks should be capable of the greatest possible sub-division so as to facilitate the interchange of wagons, by very small fractions of the park, and also to form small dépôts of supply as required. In this respect, the number 48 (not very far from 52) is quite satisfactory, and it is divisable into 2, 3, 4, 6 parts, and so on. A park of 48 wagons might be divided into two sections, each of which would consist of three sub-

[1] Viz.—264 rounds in the wagons (88 rounds per wagon) with 36 rounds in the limber.

[2] For four batteries there are 108 wagons; for 6 batteries 156 wagons are required in a park brigade—i.e., 52 wagons per park.

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sections of eight wagons each. Thus there would be, in the field parks, 288 rounds per gun [1]; and together with the ammunition carried by the battery, there would be 588 rounds per gun. In France, the battery and army corps supply amounts to 501·5 rounds per gun; but this was before the Russo-Japanese war, the experience of which will probably cause the French to increase their first-line supply.

In the Far East it was found necessary to replace the wagons of field batteries and parks by pair-horse, two-wheeled carts. Those sections of parks carrying small arm ammunition should, in view of their special employment, cease to form part of artillery parks, and be formed into separate parks of their own under the orders of Divisional Commanders. The artillery parks should be left under the orders of the Commanders of Corps Artillery.

Below, we endeavour to show that the existing method of ammunition supply is not such as to ensure ammunition being successfully replenished in the case of active offensive operations. These considerations, taken in conjunction with the experience of the recent campaign, show the immediate necessity for having with armies a mobile reserve of ammunition in the form of transport columns (not more than a day's march apart) the duty of which would be to connect the parks of Army Corps with the ammunition dépôt. Such columns would also form a reserve in the hands of the Commander-in-Chief, who, in the matter of ammunition supply has at present no means of controlling the course of events.

It would seem desirable that in such a mobile reserve of ammunition there should be one day's supply of artillery ammunition—i.e., 2,000 rounds for each battery in the force. This mobile reserve would connect the parks of army corps with the ammunition dépôt on the line of communication; the latter would be pushed forward some 3-4 marches at a time. The one day's supply suggested would, therefore, be echeloned over a distance of some 2-3 marches.

At the beginning of an action, of course the whole moves forward, and it may be hoped that on the second day's march the mobile reserve will be within a day's march of the parks of army corps, and it will then be possible to make good the day's expenditure of ammunition throughout the force.[2] The advanced dépôt on the line of communications will be 1-2 marches in rear of the mobile reserve, i.e., some 3-4 marches from the battlefield, so as far as it is possible to calculate. In the recent campaign the advanced dépôts were only about one day's march behind the troops; but in this case the operations were of a purely defensive nature, and the force was constantly falling back.

The bringing up of reserves from the advanced dépôt to fill the intermediate dépôts, &c., is carried on by rail or water, or where those means of transport are not available, by road.

[1] $\frac{96 \times 48 \times 3}{48 \text{ guns}}$ = 288 rounds.

where 96 = No. of rounds in a wagon.
48 = No. of wagons.
48 = No. of parks.
48 guns in an Artillery brigade of 6 batteries.

[2] The ammunition with batteries and in the parks will suffice for 2½ days fighting.

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Such transport takes a comparatively long time, during which supplies must be available in mobile reserves and in parks. The Germans, in the Franco-German war, forgot Napoleon's precepts and did not organize mobile reserves and parks on a large scale; they paid dearly for the omission. Their artillery was constantly feeling the lack of ammunition. They relied upon the railway connections with their own country, and did not anticipate having to use ordinary roads for their line of communications for weeks together.[1]

Nowadays the opinion is often expressed that the question of supply has been considerably simplified by the development of railways. It is true that railways afford an all-powerful means of transport for heavy stores; but the weak points of a railway, i.e., the ease with which it is threatened or demolished (especially by artificial means) must not be lost sight of.

It cannot, therefore, be reckoned that armies will always be able to utilize railways, even in their immediate vicinity, and some method must be elaborated which can be applied on those occasions when railways cannot be used, and also when the army is operating at a considerable distance from railways. Mobile reserves of ammunition, such as have been suggested above, supply the means necessary to this end.

For an army composed of four army corps (which would have in all 64 batteries[2]) 128,000 rounds of artillery ammunition are required, at 2,000 rounds per battery. Therefore, there would have to be, in the mobile ammunition dépôt, 1,707 pair-horse wagons.[3] The depth of this number of wagons in column of route would be about 9¼ miles, which is not excessive; for instance, the 3rd line transport of an army corps forms a column 7⅓ miles long.

The mobile ammunition dépôt might be subdivided into four columns (one for each army corps), and each column into four sections each composed of 106-107 wagons. While this mobile reserve of ammunition would be a reserve in the hands of the commander of the army, two sections of it should be organized in the same way as a park, with a view to their being attached (should the occasion arise) to units.

Experiments are now being carried out in all European armies with a view to substituting mechanical transport for ordinary wheeled transport. Motor transport might be adopted upon the western frontier of Russia, where there are better and more numerous roads than elsewhere in that country.

The best motor for transport purposes (shown at a competition carried out in 1905) was one drawing two wagons, manufactured by the "New Automobile Company" of Berlin.[4]

During the Austrian manœuvres in Bohemia, a motor carriage covered some 30-40 miles daily in spite of soft ground and steep

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[1] More than 185 miles to Sedan and to Paris, and about 60 miles to Orleans.

[2] i.e.—(8+6)=field batteries, and 2 horse artillery batteries per Army corps—(124 guns).

[3] Taking the weight of a round to be 14·4 lb., and the load of a pair horse wagon to be 10·7 cwt., then $\frac{128,000 \times 14 \cdot 4}{1,080} = 1,707$ wagons.

[4] "Zeitschrift des Vereines deutscher Ingenieure," No. 23, of 1906; "The life of an officer," No. 19, of 1906.

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gradients; with roads in good condition, it would have been possible to cover some 60-70 miles a day. The useful load was about eight tons, and thus the 128,000 rounds of artillery ammunition (which the mobile dépôt should carry) would, in their cases, require 103 motors of this description.

The advantages of motor transport as compared with ordinary wagons are as follows:—

1. Rapidity of movement; even on bad roads with steep gradients the pace of motors is double that of carts.[1] This would make it possible either to reduce the number of motors required by half (making only 52 motors necessary instead of 103 just mentioned) or to double the distance covered. The latter course would seem to be the best, as then the distance of the mobile ammunition dépôt from the base would be of less importance, and greater freedom of action would be the result.

2. The depth in column of route of a mobile dépôt formed of auto-motors would be $2\frac{1}{3}$ miles[2] only, as against $9\frac{1}{4}$ miles in the case of ordinary wheeled transport.

The reduced depth of the column of route, greater independence with regard to the base, and the increased rapidity of movement would all tend to make it easier to carry out intricate strategic combinations.

3. Motors, after running many miles, only need a few minutes before they are ready for further work, whereas horses require a considerable time to rest.

4. Motors only require fuel during the time they are actually working, whereas the 3,414 horses of a mobile ammunition reserve must have their forage every day, whether they are working or not.

5. A mobile ammunition dépôt formed of motors might be divided into ten columns—nine of which would consist of ten motors and one of eleven or twelve. The establishment required for each column would be:—

1 Officer.
60 N.C.O's and men (two to each vehicle).
2 Mechanics.

and, for the whole mobile dépôt:—

8 Officers.
618 N.C.O's and men.
20 Mechanics.

The corresponding establishment, in the case of ordinary wheeled transport, would amount to 1,707 men for drivers alone, i.e., practically three times the establishment required in the case of motors. The amount of mens' rations required in the case of motors would, therefore, amount to barely a third of that required in the case of ordinary wheeled transport.

The drawback of auto-motors is their complicated mechanism

[1] A day's march, in the case of motors would be about 35 miles, or on good roads nearly 70 miles; as compared with 16—17 miles in the case of ordinary wheeled transport.

[2] Allowing 14 yards for each motor and an interval of $23\frac{1}{2}$ yards between motors.

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and their liability to breakdowns. But these difficulties can be easily avoided if each motor carries the necessary number of spare parts (especially liable to deterioration), and if workshops for repairs are established on the line of communications, with one or two light motors equipped with repairing plant which can be immediately despatched to the place where the breakdown occurred.

Dépôts of fuel would have to be established at intervals; they need not be very large, as the consumption of petrol is not great—about ·9 lb. per horse power per unit. Thus a motor of the L.7 type of 22 horse power requires for a working day of twelve hours about 240 lb. of petrol and about 24 lb. of lubricating oil.[1] For all the motors of the whole of the mobile ammunition dépôt 10¾ tons of petrol and about 1 ton 1 cwt. of lubricating oil would be required daily while working. Forage for the 3,414 horses required for the ordinary wheeled transport of a column of this nature would amount to over 36½ tons, or three times the weight required for the motors.

All these considerations go to show the great superiority of a motor mobile ammunition dépôt over one formed of ordinary wheeled transport. It would seem to be desirable to carry out a thorough trial of transport motors at once, and then to organize mobile ammunition dépôts upon the Western frontier of Russia.

During a march, the ammunition wagon, (which forms, with its gun, an individual unit) should march immediately behind the gun, or if there is room, in line with it, on whichever side may be most convenient. This is the arrangement in the Russian army; but in other armies the wagons move in rear of all the guns of the battery.

Battery reserves, the only means at the disposal of the division[2] commander for retaining control upon the course of the action, should move in compact formation in rear of all the batteries of a division.

Parks should move immediately behind the troops, not further back than the 2nd line transport.

The Russian Field Service Regulations relegate them to the 3rd line transport. It would seem that if the parks are a day's march in rear they cannot be expected to afford a timely supply of ammunition.

Napoleon, when on the march, used to place his supply organizations very near the heads of the columns. For example, on the 30th September (?13th October) 1806, the leading division of the 4th Army Corps marched in the following order:—Troops, divisional park, transport, behind which the next division followed in the same order. The park of an army corps always moved immediately behind the troops of the army corps. When two army corps were marching on one road, the park of the leading army corps moved immediately behind it; and then came the second army corps. The mobile portion of the park of an army moved close behind the army. For instance, on the day of the battle of Jena, the park was only eight miles away from the battlefield. Behind the mobile portion of the army park, dépôts were formed and were pushed forward as far as the means of transport available permitted. Napoleon attached great

[1] Reckoned at nearly 1/10 lb. per unit of horse power.
[2] i.e.—The artillery division of 2 or 3 batteries.

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importance to the question of supply, and, therefore, his army never felt the lack of ammunition.

Parks must be as close as possible to the troops. Nowadays this point is of great importance, as the masses of artillery will endeavour to obtain superiority of fire from the very beginning of an action, and this requires an enormous expenditure of ammunition.

The leading echelon of the parks (i.e., one park[1]) must move immediately behind the troops, that is in rear of the first line transport of the unit.

The depth of a division on the march with its artillery, (which will move at the head of the column) is about 4½ miles. Therefore, the leading echelon of the parks will be about 2-3½ miles from the artillery; the 2nd echelon (the remainder of the parks) will be in rear of the second line transport, but not more than half a day's march behind the leading echelon. This arrangement of the parks will correspond with their disposal during an action.

Behind the second echelon of parks, on the best and most central roads, follow the columns of the mobile ammunition dépôt of the army. These connect the parks of army corps with the advanced ammunition dépôt.

In the Russian service, when the troops deploy for action, the first echelon of parks moves forward to within 2-3½ miles of the firing line[2]; the second echelon would be not more than half a day's march behind the first. In order to connect with the nearest magazines, one of the parks of an army corps[3] would be about 1-2 marches behind the second echelon.

It has already been pointed out that in the case of active offensive operations it is impossible to expect that there will always be magazines and dépôts of ammunition within two days' march of the troops; consequently, the detaching of a park to maintain connection, will be a constant occurrence, and even then it appears very doubtful whether a satisfactory supply of ammunition could be maintained. This park, a march in rear of the second echelon, provides 3,456 rounds of artillery ammunition for the whole army corps, while the average daily expenditure of each battery amounts to 2,000 rounds. If the park is two marches in rear, its supply will be only half that number—i.e., 1,728 rounds. Mobile dépôts are, therefore, indispensable to an army in order to ensure an adequate supply of ammunition. In that case the leading column of such a dépôt would be a day's march behind the second echelon of parks, and the other columns would keep up its connection with magazines on the line of communications. As the advanced or field dépôts were pushed forward, the columns of the ammunition dépôt would also move forward until the whole was within a day's march of the army corps parks, with the advanced dépôt of the line of communications 1-2 marches behind it.

As soon as an action commences, all components of the system of supply must immediately proceed to exchange full ammunition

[1] Depth in column of route=2/3 of a mile.

[2] If the parks were moving with the third line transport, this would be done next day.

[3] F. A. Maksheiev.—"Supply in time of war." p. 208.

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wagons for empty. In place of the empty wagons an equal number of full wagons are sent forward; the empty wagons are filled with ammunition brought up from the rear, and then await their turn to be sent up to the firing line. The supply of ammunition to batteries must be carried out from the rear, and with this view, the best method would seem to be to supply the guns, from the commencement from the wagons, keeping the ammunition in the limbers intact. This method is universally employed by the French; in the Russian army this method is only followed in certain cases, when wagon supply is ordered.

According to the Russian regulations, the battery's ammunition is replaced by sending back empty wagons to the first echelon of the parks; wagons of this first echelon are in turn sent back to the second echelon to be filled up; only in exceptional circumstances may a requisition be made for ammunition wagons to be sent forward. But the best method of ensuring an uninterrupted supply is by continuous movement towards the front. In the French regulations this principle is consistently adhered to; it is laid down that:—"In an army corps the supply of ammunition, for all lines and echelons, will always be carried out from the rear to the front."

Units of supply organizations must be carefully covered from the fire and view of the enemy; the best method of securing such cover is to place such units in echelon with reference to the battery.

The experience of the Russo-Japanese campaign as regards ammunition supply is comparatively limited and one-sided, because the Russian forces were almost always concentrated close to the railway, and defended or retreated the whole time. This explains in some measure the fact that notwithstanding the enormous expenditure of artillery ammunition, (about a million rounds), it did not as a rule, run short. It is often asserted, that at Liao-yang there was a shortage of artillery ammunition, and that this was one of the reasons for the Russian retirement. To what extent this dearth of ammunition actually existed will be seen from the following facts.

From a report of the Chief Inspector of Artillery with the Commander-in-Chief's Staff, we find that before the commencement of the fighting there remained in the field parks and with the batteries 330 rounds per gun.

There were 592 Russian guns[1] at Liao-yang; therefore, the artillery ammunition remaining over amounted to 195,360 rounds.

At Liao-yang 116,000 rounds were expended; that is, the remainder amounting to one and a half times as much as was expended. In connection with this point it should be noted that artillery ammunition was brought up by rail during the course of the action, and it was known that such ammunition was on its way; the latter is evident from the fact that, upon the conclusion of the battle of Liao-yang it was proposed that all artillery ammunition already *en route* by rail should be hurried up by trains running upon a passenger schedule.

Further examination of the figures concerning the ammunition

[1] Russo-Japanese war.—Lectures at the Nikolaesk Staff College. Part I. p. 91.

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supply of batteries,[1] shows that at the conclusion of the most important operations there always remained more than half the number of rounds with which the operation was begun—i.e., that as a rule, the artillery had plenty of ammunition.

The supply of field batteries up to the battle of Liao-yang (while the army was not fully equipped with parks) was carried out by means of temporary dépôts established in the immediate vicinity of the troops. These temporary dépôts were filled up by transport columns, belonging to the army. Ammunition was carried from these dépôts to the troops by the few parks at that time available. During the fighting round Liao-yang, the ammunition supply was carried out by parks attached to army corps, from magazines at Liao-yang, and later at Siding No. 101. Such a method of ammunition supply was possible only because of the short distance between the troops and the railway. When the park brigades arrived, the troops drew their ammunition from the parks attached to army corps and detachments; these parks filled up from parks placed at the disposal of the Commander of Artillery to keep up connection with intermediate magazines, which in turn were filled up from the central magazine at Harbin.

A reserve of artillery parks was kept at the disposal of the Chief Inspector of Artillery. It was first formed in September, 1904, in connection with the Russian advance on the Sha Ho, and consisted of five parks. Its duties were:—

1. To form intermediate dépôts, to be pushed forward as the advance proceeded.
2. To connect these dépôts with the parks of the operating army corps.
3. To bring up ammunition to units which did not possess parks of their own, and,
4. To carry out an extra supply of ammunition at any desired point.

All these duties were carried out successfully.

The 3rd Siberian Army Corps, operating on the extreme left flank, only received an adequate supply of ammunition by means of the timely despatch of two parks from the reserve to establish connection with the parks belonging to that corps. The 6th Siberian Army Corps, which took part in the fighting on the Sha Ho, was without its parks, which had not yet arrived from European Russia. It was only by means of a park detailed from the reserve that this army corps received an uninterrupted supply of ammunition.

At the close of 1905, only three parks remained in reserve at the disposal of the Chief Inspector of Artillery; still, the enormous advantage of having even such a small reserve as this became very evident in the battle of Mukden. It was solely due to that reserve that an adequate supply for the 3rd Siberian Army Corps, and the troops collected at Tsu-erh-tun (to each of which forces a park was sent), was kept up. Lieut. General Danilov's force was only relieved

[1] **Reports of the Chief Inspector of Artillery on the C.-in-C's. Staff. pp. 6 and 7.**

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from a very critical situation by the arrival of a park of the 3rd brigade, which marched 50 miles in one day and then supplied it for six days, although it was thirteen miles from the nearest magazine.

In conclusion it may be said that the expenditure of ammunition in future wars will exceed expectation, just as it exceeded all such anticipations in the Franco-German war of 1870, and in the recent Russo-Japanese war.

1. It would be imprudent to estimate the normal reserve of artillery ammunition required during the first months of a war at less than 3,000 rounds per gun. There is nothing startling about this number; it was the normal amount kept by Napoleon at his base of operations, exclusive of ammunition remaining in the arsenals of the mother country.

During the recent war, the small supply of artillery ammunition available in Russia, owing to strikes among workmen in the Government factories in 1905, obliged us to obtain ammunition abroad. It will be, of course, impossible to do this in the case of operations in Europe. This is a question which requires careful consideration. It is only necessary to imagine the position of an army having in the course of an action lasting a fortnight or three weeks, exhausted its ammunition in the face of a well supplied enemy. The current supply of ammunition to be always maintained in the theatre of operations, for replenishing, must not be less than 1,000 rounds per gun, which is already laid down in the Russian regulations. For the Far East, in view of the 7,000 miles between that theatre of war and the home magazines, the normal amount should be fixed at 1,500 rounds per gun.

2. A prudent and reasonable expenditure of ammunition is one means of securing an adequate supply.

For this reason fire should only be directed upon defined and vulnerable objects, at reasonable distances (say 3,500-4,500 yards), and with a view of attaining a definite tactical result. In this respect, the experience of the late war is little or no service to us. The Russian troops never suffered from lack of ammunition, and they do not at present recognize its value.

3. Mobile reserves of ammunition for armies should be created, to form a reserve in the hands of General Officers Commanding armies.

4. Without the necessary supply of ammunition there can be no fire, i.e., no proper action. All commanders, therefore, must be thoroughly acquainted with the whole question of supply, and they must secure ample ammunition for the batteries.

5. Artillery commanders in front line must be relieved of all anxiety as regards ammunition supply, and to this end an uninterrupted supply of ammunition must be maintained by means of a general movement "forward," as in the French army. Each echelon

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of the ammunition supply must establish connection with the echelon in front of it. The French regulations show exactly how such connection should be established, and they should be adopted with a view to creating a satisfactory system of supply.

6. Personal initiative must be widely developed. In the Russian regulations for the supply of ammunition to troops and artillery parks in war, it is well said (¶28) that Commanders of Park Brigades must, in the absence of orders, act on their own initiative. But in the "Field Service Regulations" it is laid down that parks are to be brought up by order of the Commander of the Army Corps Artillery. But what if no such order is received?

In the Franco-German war the system of command was precise and methodical, but orders were often not received. In future, this will happen still oftener, owing to the concentration of still larger masses of troops. For this reason a great development of initiative is required. With this view it should be laid down in regulations that commanders of all grades must make use of every possible means to ensure the timely replenishment of ammunition. In circumstances not provided for by regulations, or in the absence of orders, they must act upon their own initiative.

7. During the late war, stores of ammunition were formed by the troops, on the positions occupied. This should undoubtedly be put a stop to. No account being kept of such ammunition, it cannot be used for the indiscriminate supply of the troops; in the event of the troops advancing special parks have to be detailed for the transport of such ammunition, and in the case of a retreat matters are even worse.

8. All administrative authority in connection with the supply of ammunition should be in the hands of one individual. In the late war there was the Chief Inspector of Artillery units, on the Commander-in-Chief's Staff, and equal in status to that officer there were three other Inspectors of Artillery with the armies., The result was very unsatisfactory. The whole weight of the work of supply lay upon the Chief Inspector alone, while the three Artillery Commanders with the three armies were merely links in the chain of distribution and the cause of delay, and sometimes even of discord.

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THE NEW ITALIAN FIELD ARTILLERY EQUIPMENT.

By COMMANDANT D . . . .

Translated from the "Revue Militaire Générale," June, 1907.

By 2nd LIEUTENANT H. W. YOUNG, R.G.A,

IT is known that Italy has adopted (in 1906) a quick-firing equipment on the Krupp system—After witnessing the trials of the gun and carriage held in the artillery practice ground at Nettuno, at which Signor Vigano, the Italian war minister was also present; the sub-committee on military expenditure have issued the following *Résumé* of the properties of the Italian field gun (1906 Mk.), and express themselves convinced of its superiority.

The muzzle velocity is higher than that of the field gun of any other country except France: but the French equipment is heavier than the Italian, and is also inferior to it in some other respects.

The shrapnel shell contains a greater number of bullets than that of any other power, with the exception of the Belgian 75 mm., and the English 18-pounder.

The rate of fire has been brought to a *maximum.* (30 rounds per minute. See table.)

Laying is easier than with any other equipment, owing to the employment of the best methods yet invented, i.e. telescope with wide field, laying along an independent line of sight, etc. . . .

In spite of the reduction in weight, it is found that the steadiness of the carriage compares well with that of other equipments.

The shields are of exceptionally good steel, being proof against rifle fire at a range of 200 metres, though only 4 mm. thick.

The wagon is lighter, and the battery consequently more mobile although 312 rounds are caried per battery as in the French Artillery.

The report ends with the following comparative table of the field equipments of Italy, Great Britain, Germany, France, Austria, Belgium, and Switzerland.

Comparative Table.

Date.	Italy. 1906.	Gt. Britain. 1905.	Germ'ny 1896.	France 1897.	Austria 1905.	Belgium 1905.	Switzerland 1903.
Calibre	75 mm.	83·8 mm.	77 mm.	75 mm.	76·5mm	75 mm.	75 mm.
Muzzle Velocity	510 m.	491 m.	465 mm.	529 mm.	500 m.	500 m.	485 mm.
Weight of projectile	6·5 kg.	8·388 kg.	5·83 kg.	7·24 kg.	6·8 kg.	6·5 kg.	6·35 kg.
Number of Shrapnel bullets	364	364	300	300	320	360	216
Limit of range for time fuzes	5,000 m	5,760 m.	5,000 m.	5,500 m.	5,600 m.	6,000 m.	*5,900 m.
Extreme range	5,800 m.	5,800 m.	6,800 m.	8,500	6,300 m.	6,800 m.	*6,500 m.
Rate of fire per minute	10 r'nds	20 rounds.	20 r'nds	20 r'nds	21 r'nds	30 r'nds	25 rounds.
Weight of gun and breech block	315 kg.	457 k.g.	390 kg.	400 kg	330 kg.	360 kg.	350 kg.
Recoil	1·44 m.	*	*	1·09 m.	1·27 m.	1·3 m.	*1·35 m.
Weight of gun and carriage	1010 kg.	1,223 kg.	945 kg.	1,200 kg.	950 kg.	1,030 kg.	1,000 kg.*
Thickness of shields	4 mm.	*	*	5 mm.	4·5 mm.	5 mm.	4·25 mm.
Weight of gun, carriage, and limber	1,700 kg.	1,958 kg.	1,740 kg.	1,885 kg.	1,700 kg.	1,757 kg.	1,750 kg.
Weight of wagon	1,750 kg.	1,918 kg.	1,780 kg	2,000 kg.	1,800 kg.	1,785 kg.	1,820 kg.

N.B. 100 metres = 110 yards.
1 kilogram = 2¼ lb.
5 millimetres = ·2 inches.
} Roughly.

* Not given.

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In the report on the military budget for the year 1907-1908, the following views are expressed on the subject of the changes in artillery organisation which will have to result from the adoption of a Q.F. equipment:—

"The adoption of the new field artillery equipment will make "it necessary to supply batteries with a larger quantity of ammuni-"tion, and consequently more horses and vehicles for its transport."

"The number of guns in a battery will have to be reduced to "four, this reduction being compensated for by the increased rate "of fire, but the proportion between our artillery and that of the "other European powers will have to be maintained."

"Ninety-six field guns will therefore be retained in each army "corps, while to some of them a few mountain batteries will be "added, over and above the batteries of field artillery."

"Rivista Marittima."

PRECIS OF CONTENTS.

By LIEUTENANT J. R. LITTLE, R.F.A.

July and August, 1907.

1. The first day of Tsushima, according to Semenoff, one of Rodjestvensky's staff. Preparatory formation in which the fleet approached the straits of Tsushima. Vivid description of the battle up to the evening of May 27th (with diagrams).

2. Description and calculation of power, pressures, etc., of the Diesel motor engine, with 2-stroke cycle, reversible, for marine purposes. Engines of this kind have not hitherto been produced of more an 600 h.p.; but the writer does not see why larger ones should not be made, and his calculations are for one of 3,600 h.p.

3. Italian commerce in 1905—A statistical article—It may be remarked that the imports from Great Britain were larger than from any other country. The general conclusions drawn from the statistics by the writer are, that Italy is more prosperous on the whole than ever before, and is sharing in the universal expansion of trade: but the progress is more in manufactures than in agriculture, and therefore more in the north than the south, which depends entirely on agriculture and is still in a backward condition.

4. The stability of smokeless powders. The many disasterous explosions of recent years, notably in the case of the "B" powder used by the French for military purposes, render it imperative to discover some means of arresting, or failing that, of detecting decomposition in smokeless powder. State of the question in France. Summary of researches of Signor Jacqué of Bilbao on causes and process of decomposition and methods of testing stability of powders. No disastrous explosion hitherto in Germany, where they use an ingredient which gives an indication of decomposition by a change of colour in the powder, and also one which is supposed to arrest decomposition.

5. The regulation of secondary studies in Italy, in relation to the needs of the Royal Naval Academy.

6. Medical and sanitary service in naval warfare. Its functions are—

(*a*). To preserve the personnel in health and fit for service; under this head the writer discusses hygiene, rations, and diseases.

(*b*). In the fight, to clear away the wounded, and return as many as possible to duty—For this good organisation is essential, and the following are discussed in detail:—Dressing and collecting stations.—Transport of the wounded and organisation of the medical personnel.—First aid and medical appliances and stores.—Care and disposal of the wounded after the battle. The writer praises the results attained by the Japanese in the late war.

Excellent notices of foreign naval doings. Launches, trials, manœuvres etc., with photographs.

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September, 1907.

1. "War against war." Review of a recent book with this title by General Perucchetti, in which "anti militarism" is condemned. The book contains the following suggestions and proposals:—The German system of organisation and training is not entirely applicable to the Italian army. The eastern frontier is weak and should be guarded by an entrenched camp extending from Butrio to Marano Lagunare (35 kilometres), estimated cost 100 million lire.—Proposals for naval defence works about Venice.—Proposal to make the Gulf of Naples a harbour of refuge and base of operations; this is condemned by the reviewer.

2. "Aeronautics applied to the Naval Service. Advantages of a lofty point for observation, in open sea, over natural obstacles and in bombardments, and for detecting submarine mines.—Recommends captive elongated balloons, and kites.—

(*a*). From fixed stations, on the coast.
(*b*). From floating stations, either special vessels or existing warships.

Kites, from ships—"tandem" kite of Hargrave type recommended.—Safety apparatus.

3. "The system of protection as applied to mercantile marine." Review of the methods employed by foreign countries:—

(*a*). The system of subsidies. (*b*). The system of giving the shipping of the country privileges, exemptions, premiums as against foreign shipping.

4. "Subjects of Maritime interest at the 6th Italian Geographical congress." Dealing mostly with proposals for the further study and nomenclature of the Italian seas, and river basins, colony of Eritrea, etc.

Supplement. — Development of the world's shipping, during the 19th Century—the mercantile marine—illustrated by many statistical tables.

"Rivista di Artiglieria e di Genio."

PRECIS OF CONTENTS.

By LIEUTENANT H. de WATTEVILLE, R.G.A.

April, 1907.

"On the Training of Field Batteries."

"Capt. Cardona's Notes on Improvised Fortifications."

"Considerations of the Armament for Coast Batteries."

"The new German Provisional Regulations for Field Fortifications."

"The Piedmontese fortress artillery in the campaign of 1848-49."

There is a very interesting abstract on p.149 of an article in the French "Journal des Sciences Militaires" for February by Col. Novibov, on the artillery tactics of Manchuria.

May. 1907.

"On the use of tools for infantry, and the mode of carrying these."

"Variations on the usual theme."

"On the preparation of coast battery fire against moving targets."

"The Piedmontese fortress artillery in the campaign of 1848-49."

"Should we retain the axle seats on the guns?"

"The new German Regulations for Heavy Artillery."

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Revue de l'Armée Belge.

PRECIS OF CONTENTS,

BY LIEUTENANT K. B. FERGUSON, R.G.A.

May—June, 1907.

1. Some lessons from the Russo-Japanese war for Artillery; by Capitaine-Commandant A. Hellebaut.

The author bases his article mainly on three French works on the subject. "Artillery in the battle of Aug. 18th"; by Lieut.-Colonel Rouquerol, the author of a book on Q.F. Artillery which has been translated into English. "Tactical lessons from the Russo-Japanese war"; by Capitaine Niessel and "The Russo-Japanese war"; by Chef d'Escadron Meunier.

He disputes some of Meunier's conclusions about relative losses in this and previous campaigns, and holds that losses tend to become less severe nowadays, though weapons are being perfected, because men's nerves are becoming more high-strung, and wholesale slaughter becomes more repugnant in consequence. Captain Hellebaut strongly deprecates the tendency to cling to concealed positions and take shelter behind gun shields, and argues that peace training should be made to counteract that dangerous tendency.

The article is to be continued in subsequent numbers.

2. "A Study in Musketry"—continued from preceding numbers; by Capitaine Bisman.

As pointed out in our last Précis, this series of articles is designed to work out the relative fire effect to be expected in the field against troops in various formations and at various ranges. The author works out several problems to illustrate his theories, and announces that whereas he has hitherto considered his subject purely from the scientific point of view, its tactical application will be dealt with in succeeding numbers.

3. "Notes on Greece, Turkey, and the Graeco-Turkish war of 1897"—continued from earlier numbers; by Lieut.-General Neyt.

This number is purely historical, with some remarks on the Mohammedan religion, and mainly deals with the period between 1879 and 1886.

4. "A final word about the Cavalry Musketry Regulations." A counter-reply to the article which was referred to in our last Précis.

The present writer vindicates the new Belgian Musketry Regulations for Cavalry, and argues that Cavalry should be trained to high efficiency in the use of our firearms as well as "cold steel."

5. "On the study of Oriental Languages"; by Lieut.-General Neyt.

The General reviews some recent publications on the subject, and urges his countrymen to prepare themselves for competition with other nations in the East.

6. "The Schwarzlose Mitrailleuse, 1907 model."

A long and exhaustive article on this new gun, which is of Austrian origin, and is on its trials at present in Austria. There are seven plates illustrating the mechanism and method of firing, etc.

7. "The influence of the Russo-Japanese war on tactics"; by Lieut.-General Neyt.

A short article, reviewing very favourably a recent publication on the subject in the "Estudios Militares" of Madrid, by Captain D. Pedro Jevenois.

8. "The Committee of the 2nd Line of Defence of Antwerp," continued. Report of proceedings, etc.

This Committee has been appointed by the Belgian Government to investigate and advise upon the best positions, etc., for this 2nd Line of Defence, which it has been decided to establish.

9. Notices of books, etc.

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A FEW LESSONS FOR ARTILLERY FROM THE RUSSO-JAPANESE WAR.

By CAPITAINE-COMMANDANT A. HELLEBAUT.

Précis from the "Revue de l'Armee Belge."

By LIEUTENANT K. B. FERGUSON, R.G.A.

At the risk of wounding many who would like to constitute themselves the prophets of a new faith in things military, it must be said that the adoption of improved weapons, and especially of Q.F. guns, has altered nothing in the fundamental principles of tactics, or in the employment of artillery. As I pointed out in this review in 1904, it is useless to possess a gun which can achieve wonderful percentages of fire effect if it is not adapted to the men who are to handle it. Furthermore, in attaching too much importance to actual fire effect, there is always a danger of abusing the advantages of cover, and of sacrificing boldness of manœuvre; the result being undue extension of front, suppression of the reserves, and tactical envelopment made into a vital principle.

It may be true that the Japanese were victorious on certain occasions through their endeavours to envelop one or both of the enemy's flanks; but these victories were quite indecisive, and were largely due to the immobility of the Russians, who remained rooted to their positions. Cold steel still remains the decisive factor in action, the necessity of maintaining reserves still holds good, and success will, in the future as in the past, go to those who are ready to expose themselves when necessary to the heaviest losses.

The more weapons are perfected, the less deadly do battles become. In 1904 I called attention to the fact that, for various psychological reasons, the soldier who is called upon to work these weapons of extreme precision becomes less and less capable of accomplishing the results which, in theory, should be expected of them; and that fact is still true. The losses in the late war were relatively less heavy than in previous campaigns. For instance, on the three worse days of the Sha-Ho battle, they totalled 62,000 (46,000 Russians, or 22%, and 16,000 Japanese, or 9%) whereas on the three days of Colombey-Nouilly, Vionville-Mars la Tour, and Gravelotte-St. Privat, they came to 74,000, (41,000 Germans, and 33,000 French.) The total number of deaths in the Russo-Japanese war 80,387 against 43,182 in the Franco-German war, but that includes deaths by wounds and by disease, and does not give us the total number of men put out of action by fire-arms within a given number of combatants. At Liao-Yang the losses were 11·5% of the total forces engaged, and even this was spread over five days; whereas at Mars la Tour the Germans alone lost 22% roughly in one day. At the battle of Sande-Pu, where the losses are said to have been the heaviest of the whole war, they came to roughly 22% of all the forces engaged; against this we need only point to 24% at Eylau, 34% at Essling, and 38% at Borodino.

As for the losses actually caused by artillery fire, Captain Niessel, who has investigated the matter, puts them at only 7% of the total losses suffered in the Russo-Japanese war. In other words, for an enormously greater expenditure of ammunition, the effect produced has been less than that of the old slow-firing artillery. The guns appear to have effected less by actually inflicting losses than by keeping down the mobility of the enemy; and they probably owed this largely to the of their rectangles and scientific calculations in time of peace. When the enemy begins to find them out, that charm may lose its power.

Meunier quotes a letter from a Japanese writer who watched some Russian artillery firing at two Japanese batteries, apparently with terrible precision. The Japanese guns were silenced in a short time; but to the surprise of the observer, they began firing again soon after, and a duel went on till the evening. When all appeared to be over, he went up to the batteries expecting to find death and destruction on all sides; but the whole damage for the day was one officer and four men killed, two and thirteen wounded, and one gun-wheel broken. Results like these could have been secured quite as well with ordinary accelerated fire as with Q.F. guns.

It has been remarked, especially with reference to the battle of Wa-Fang-Kou, that Japanese artillery fire was usually more effective than Russian, because it was less rapid, or less nervous and hasty. There is reason to doubt that slow-firing guns would also be very effective in checking the enemy's mobility if that enemy were much addicted to taking cover; it would be equally well able to tie him down to his cover, epaulments, or shields.

It is far from my intention to suggest that because Q.F. artillery has not yet realised all that was expected of it, it should be rejected. The bare percentage of losses caused by guns only gives a very inadequate idea of the role and influence

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of artillery in action. Though it was not well handled in the battles in Manchuria, the co-operation of artillery was found to be more necessary than ever before for the other arms. But its material effect would have been much greater if the fear of hostile artillery fire had not led to firing at unduly long ranges, and to the abuse of concealed positions. This evil practice by no means tended to shorten battles or make them more decisive. Captain Niessel, an eye-witness, drew attention to the very frequent adoption of indirect fire; "there are cases," he said, "of Russian batteries placed 500 yards in rear of crest-lines, and 60 feet below their level. The result is naturally most unsatisfactory. Not only are the objectives invisible, so that special means of laying have to be devised, but battery commanders are compelled to keep far away from their guns and to send down their observations and orders by telephone or by signallers. There is a large extent of dead ground in front of the obstruction; it becomes extremely difficult to follow moving targets, and almost impossible to follow the different phases of the action properly." Lt.-Col. Rouquerol, in his recently published study of the battle of August 18th., points out the danger of having the battery commander away at a distance from his battery, and alone able to watch the battle; if he should happen to be put out of action, his successor is completely in the dark. He admits that isolated cases may occur when field artillery will have to act very much like siege artillery, but these cases must not be taken to establish a general rule. The question of training batteries to fire by signals or by telephone is receiving attention at the present day; but it is only for use in special cases.

The Russo-Japanese war has proved once more the necessity of concealing the movement of batteries when they come into action, or change their positions, etc., as well as the movements of their limbers and wagons. Battery commanders and observing parties reconnoitring are also very apt to give away positions. All this was illustrated long ago, before artillery attained to its present ranging power.

"In their anxiety to remain invulnerable," says Captain Niessel, "artillery often come into action at too long ranges, and remain out of range. The abuse of indirect fire sometimes makes timely intervention in the different phases of an action impossible, so that there is a lack of concerted action between the different arms. When it goes as far as this, the wish to avoid losses becomes a hindrance to the offensive action of artillery. We should certainly try to resist this tendency by effective training in time of peace, without erring in the opposite direction." A reaction appears the more necessary, but at the same time more difficult, in view of the adoption of gun-shields, which tend to accentuate this deplorable complaint among us. The shields give no protection while coming into action, nor do they give protection at any time to the teams, on whose movements the continuous supply of ammunition depends. Consequently they will not tend to reduce the desire to get under cover quickly, and to remain as long as possible in positions in rear of which is ground concealed from hostile observation. Moreover, to be logical we should have at least one wagon or limber up beside each gun to protect the battery commander and other important details besides the detachments; but then the new batteries would offer a much larger exposed surface than before.

This would help the enemy considerably in ranging with percussion fire, against which gun shields are not proof; so that unless we dispense with the much vaunted advantages of gun-shields, our new artillery will have to rely on concealed positions in order to remain invisible. Now that shields have been adopted everywhere, however, their advocates should cease to preach incessantly the need of sheltering the personnel. Our over refined nerves and sensibility are quite sufficient to prevent us from overlooking that point. There is an ever-present danger that the necessity of making use of the shields, which are a dead weight behind the teams, and of the ingenious laying instruments, which appear likely to assimilate field guns to siege artillery in their methods of fire, will increase our temptation by affording pretexts to us. So that if we want our artillery to retain its indispensable power of offensive action, we must educate ourselves in peace time to make sacrifices. We must subordinate cover to fire effect, and remember that the gun-shield has its limitations, and is only good under certain conditions.

Omelettes cannot be made without breaking eggs, and the great object in war is to overwhelm the enemy's forces in the shortest time possible, not to gain time by that excess of prudence which is so unfortunately coming into vogue.

(To be continued).

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Reports, Precis, Translations, Etc.
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CONTENTS.

"Memorial de Artilléria.." Précis of contents. By Major General J. C. Dalton, R.A. 303

A few lessons for Artillery from the Russo-Japanese War. By Capitaine-Commandant A. Hellebaut. Précis from the "Revue de l'Armée Belge." By Lieut. K. B. Ferguson, R.G.A. 307

"Streffleur's Militärische Zeitschrift." Précis of contents. By Lieut. C. O. C. Hunt, R.F.A. 309

"Journal des Sciences Militaires." Précis of contents. By Lieut. C. O. C. Hunt, R.F.A. 314

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"Memorial de Artilléria."

September, 1907.

Précis of Contents.

BY MAJOR GENERAL J. C. DALTON, R.A.

THIS number is an interesting one. It is practically all taken up by an exhaustive article on explosives, published by authority, the result of the labours of the Artillery Experimental Committee.

For many years experiments have been going on with high explosives for shells, and all kinds of explosives have been tried in connection with steel projectiles made chiefly in Germany, at Dusseldorf, Essen, &c.

The lessons of the Transvaal and Russo-Japanese wars have been studied. Officers were sent abroad to further study the weapons and ammunition in use, and shells were acquired from the manufactories of Schneider, Mayz-Felisdorf and Krupp loaded respectively with Schneiderite, Ammonal, and picric acid. Hand grenades were also included in the experiments. These explosives are fully described and analyzed; the force developed, and bursting force are considered, and the action of damp studied.

The effects of the explosives when fired in shell are given as regards:—

1. Breaking up of the projectiles when at rest.
2. Ditto. when enclosed in earth.
3. Effect of the shock on parapets and entrenchments.
4. Effect on the blindage of a shelter trench.
5. Effect against permanent works.
6. Ditto. the shields of field pieces.
7. Ditto. plates which cannot be penetrated, the shell being fired without detonator.
8. Influence of the shock of projectiles against other loaded shell.
9. Detonation by "influence" in projectiles, with and without detonator.

The paper is accompanied by excellent photographic reproductions of ammunition and fuzes, and complete results of the experiments are tabulated, together with illustrations of the effects of the explosions on matériel, parapets, walls, &c., which are well worthy of study by those interested in this branch of artillery science.

The results deduced from the experiments are very fully considered, but the Committee were not able to come to any very definite conclusions for reasons which they give, though they deal at some length with the various points. They wish to continue the experiments, but require a freer hand in the acquisition of new matériel, &c.

The data as regards the various explosives and projectiles used are given in detail in an appendix.

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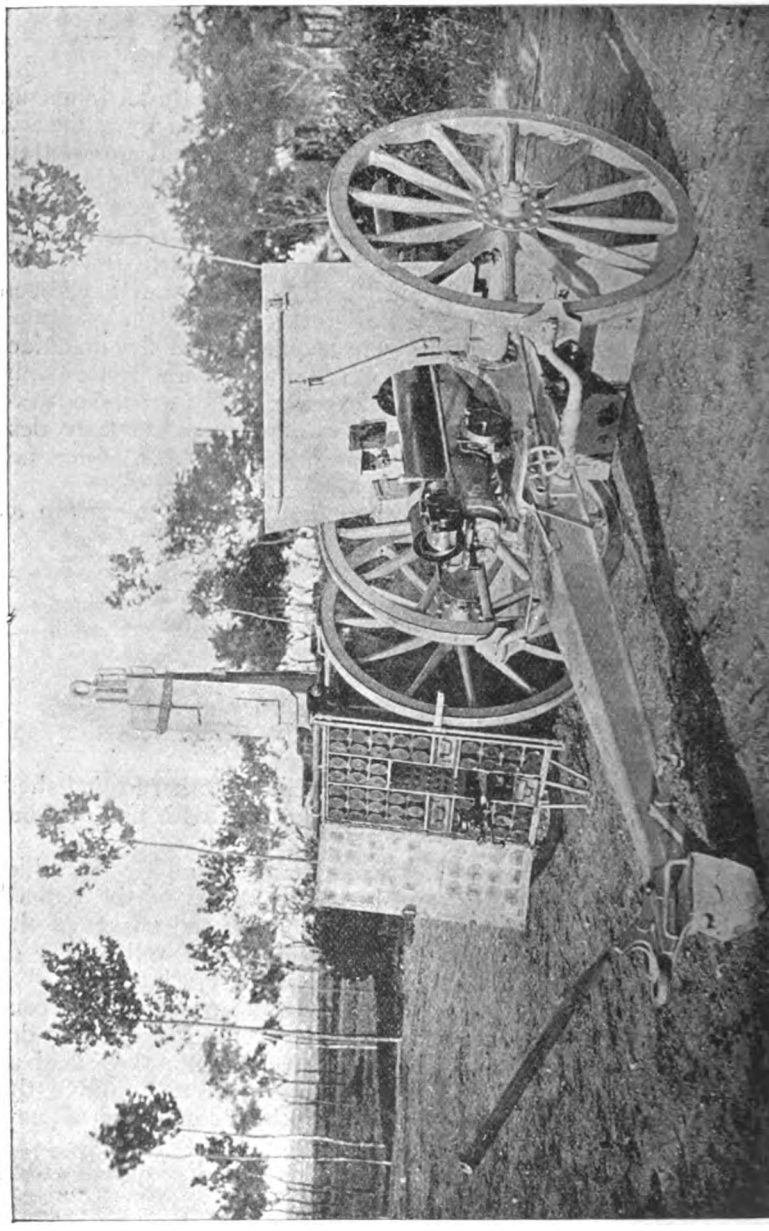
NEW FIELD ARTILLERY EQUIPMENT.

ON 14th July, 1907, the first battery of the new Field Artillery Equipment was received in Madrid and consisted of four guns and four wagons of the new 75 millimètre matériel which the house



Gun and wagon body in battery.

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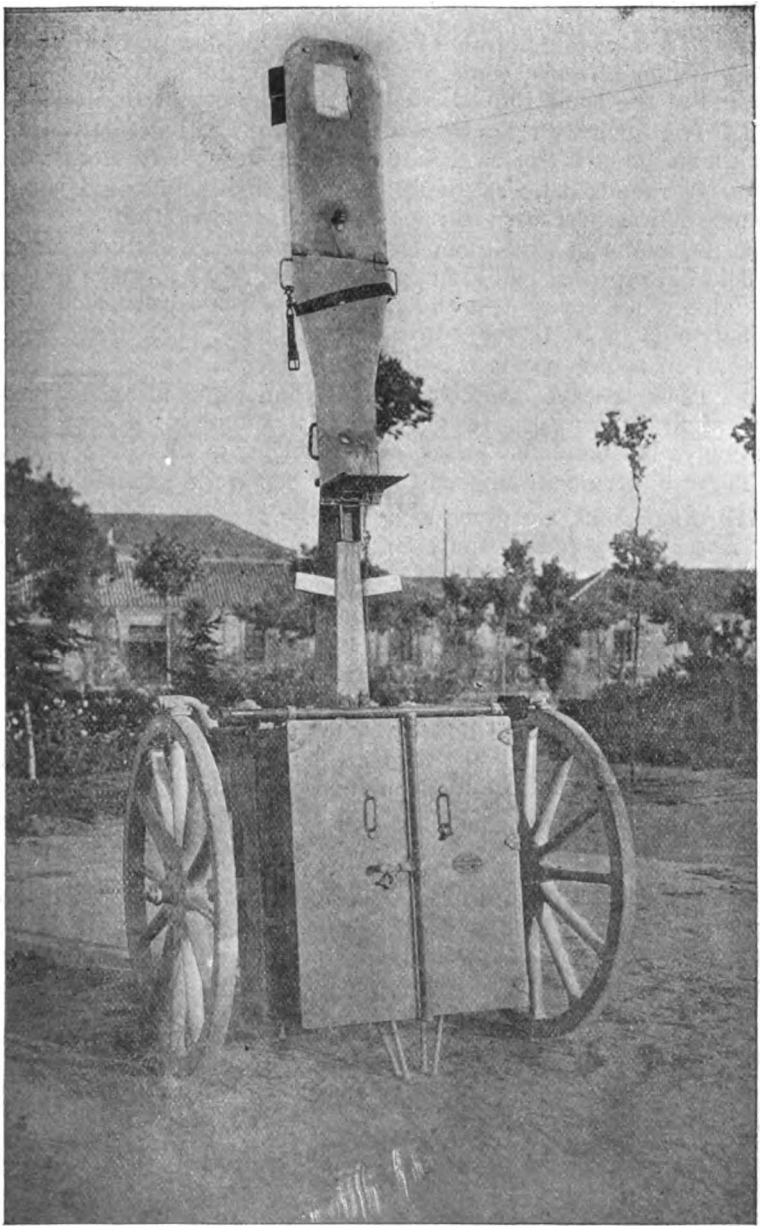
of Schneider & Co. is manufacturing for the field artillery regiments in Spain.



Wagon with armoured observatory.

200 guns are to be acquired if the matériel proves satisfactory after experiments have been exhaustively made. The new battery

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was officially inspected by the War Minister and chief military heads on July 18, in the Hippodrome, and experiments were started. The wagons are of the class called "observatory."

The trial of the guns for "resistance" consisted of:—

1. 20 rounds to determine the charge of tubular powder No. III., which gives an I.V. of 500 metres, the pressure in the chamber being measured at the same time as well as the stability of the mounting.

2. The guns were horsed and taken for 172 Kilomètres, 80 at a walk, and 92 at a trot as a battery of horse artillery along roads.

3. 30 rounds deliberate and rapid fire, five at an angle of 25° for which it was necessary to have complete recuperation.

4. A march of 279 kilomètres, 157 at a walk and 122 at trot, as a field battery over bad roads purposely selected to test the matériel. This was a severe test and the roads selected were such as are only supposed to be fit for 2-wheeled vehicles.

5. Ten rounds per gun.

6. Four series of twenty rounds a gun rapid firing, to obtain a rate of fire of *at least* twenty rounds a minute with intervals of ten minutes between each series, and at angles of elevation over 2°.

These experiments appear to have been quite satisfactory.

All dimensions are given in a table. The armoured "observatory" made by up-ending the ammunition wagon is very ingenious.

COURSES OF PRACTICE AND GUNNERY FOR 1907.

The syllabus of these courses is given in this number. The courses are very complete both for field and garrison artillery, and take place in the autumn, the field artillery school being at Madrid and that for coast defence at Pamplona. Night firing, goniometric and mirror sights, balloon observation, indirect fire of various kinds, use of the Costilla predictor, the Zaragoza telemeter, Tolosa sighting gear, &c.

General and special ideas are worked on. The courses are attended not only by field and coast artillery officers from all stations including those in Africa, but also by the General Staff of the army and by regimental officers of other arms, nominated by Military Governors, &c. The courses appear very thorough.

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A FEW LESSONS FOR ARTILLERY FROM THE RUSSO-JAPANESE WAR.

By CAPITAINE-COMMANDANT A. HELLEBAUT.

Précis from the "Revue de l'Armee Belge."

By LIEUTENANT K. B. FERGUSON, R.G.A.

(Continued from page 302).

There is another lesson to be drawn from the Russo-Japanese war,—from the failures of the method of firing at progressive ranges with a view to searching woods and valleys, or spreading one's fire over a larger area where the enemy may have his reserves. Experience showed that every time the Russians and Japanese tried this, they consumed enormous quantities of ammunition for results practically nil. Some Japanese artillery at Ta Chi Chiao, fired for a long time at Russian trenches that were unoccupied; a Russian battery at Liao Yang fired for three hours at a valley, also unoccupied, expending 2,500 rounds; the Japanese on another occasion distributed fire for an hour and a half every day, for four days, over a zone where they thought there might be some Russian batteries, though this was actually not the case.

Finally, the Russo-Japanese war justifies those who objected to pushing guns too far forward against the enemy's infantry, on the pretext of supporting the advance of their own. Before the war, the Russian and Japanese drill-books, in the same way as the French, advocated this forward movement; yet it was not made in a single instance, because both adversaries saw that it would lead to certain losses without any compensation. Artillery, which acts only by fire, can always help its own infantry better by firing than by any manœuvres; besides, it offers too large objectives to be able to advance over open ground without the risk of certain destruction.

The lessons of the war are not, however, merely negative. If it has upset many theories and prejudices, it has also shown us a great deal from which we can deduct the true rôle of modern artillery. For instance, the Japanese usually sent small mixed detachments on ahead of the advanced guard. These detachments contained one or two batteries of artillery, and were intended to feel for the enemy's whereabouts, perhaps to drive back his advanced troops; they were frequently able to detect the outlines of the enemy's positions, and to furnish information which largely affected the development of the Commander-in-Chief's plans. They consisted chiefly of cavalry, and were intended for cavalry action either against hostile cavalry, or by surprise attacks against the head of mixed columns; but in both cases they required the support of horse artillery. With that support, combining extreme mobility with offensive and defensive power, they could give the Commander-in-Chief far more freedom of action than any advanced guard containing infantry. Without it, however, they would lack strength and striking power,—the power to see by compelling the enemy to show himself. Here is one clearly marked function of Q.F. Artillery.

It has others when with the advanced guard. The duties of the advanced guard are to reconnoitre the enemy's dispositions so as to enable the Commander-in-Chief to make his arrangements for action. The enemy, during this preliminary phase of a battle, will usually find it possible to reveal only just as much as he chooses to; and it is with a view to breaking the resistance itself long enough to enable the main body to deploy, that the advanced guard of a large force requires the support of artillery. History has shown by frequent instances—notably in the case of the batteries of the IXth German Army Corps at Gravelotte,—that strong bodies of artillery cannot deploy without very grave risk until the advanced troops have obtained control of what Colonel Rouquerol calls a sufficient "zone of security." This the advanced guard must do; and it requires artillery for the purpose.

At the same time, guns with the advanced guard have passed the next one ahead of them. Concealed positions are of greater importance for the artillery of the advanced guard than for that of the main body; and they should also spread out over the largest area possible, not only for safety, but also to deceive the enemy as to their strength. The positions selected should be such as will compel the guns to move about as little as possible. The change of positions is not only often dangerous in itself, but it also implies a period of forced inactivity followed by the loss of time spent in fresh preparation for action and ranging. This, however, does not apply to slight changes of position, such as were frequently made during the last war by man-handling the guns, when it became necessary to remove them from a heavy fire, which should always be possible if the field gun is as mobile as it ought to be.

The artillery with the main body should all come into action from the very out-

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set, follow carefully the movements of the infantry, and give it every effectual aid. The Japanese always endeavoured to do this, whereas the Russians suffered from a persistent habit of sending up their guns in driblets, keeping the bulk of them in reserve. Failure of both artillery and infantry was the inevitable result, although the former showed in several instances,—notably at Ta Chi Choa and Yang tse Ling,—that if properly handled, they could support their own infantry as well as any.

Concentration of fire was adopted with complete success, and we should never hear any more of that false economy of strength which allotted to each battery a particular sphere, within which it was to destroy all possible objectives. Another exploded idea is that of opening fire on the enemy's batteries in succession as they appear. If we waited for them to do that, very little that is decisive would be accomplished, and the infantry of both sides would be left to fight it out alone. Concentration of fire is not to be taken as a fixed idea and applied without any regard to particular circumstances; but we must certainly not give way to an opposite tendency to think that with our highly advanced matériel, rapidity of fire can take the place of concentration.

The war in Manchuria showed us again in repeated instances that artillery positions must be concealed. But as it was still absolutely essential to be active at all times, the Japanese adopted three devices:—

1. They brought up their guns into position by night. This, however, could not be done against a vigilant enemy.

2. They put guns in conspicuous positions, but out of range of the enemy's artillery; the Russians, however, soon saw through this trick.

3. They put up dummy batteries and fired puffs to complete the illusion.

This is also obviously a mere local expedient, so the question remains how to combine activity with concealment, and the only way must be to be thoroughly prepared to take risks when necessary. For some guns that will be put out of action there will be many others inflicting losses on the enemy, and weakening his morale.

In spite of what many critics have said, we cannot agree that this war saw the end of the artillery duel. It is true that it no longer forms a quite distinct preliminary episode before battle, as in the Transvaal war; but it certainly took place before every battle in Manchuria, and went on till the end of it. In fact, the only change perceptible in Manchuria was that the artillery duel continued longer than ever before. This was perhaps due to the prevailing idea that artillery cannot be definitely put out of action, but only temporarily dominated, because the result was that when a battery was silenced this way, the detachments merely went under cover for a time and then began again,—even if reduced by one or two guns. These tactics, however, cannot always be counted upon, especially if the enemy ranges well and is wise enough to make use of percussion fire, against which gun-shields are not proof. It will have to be our object to try and obtain decisive results by bringing converging fire to bear on the enemy's artillery, using shrapnel and percussion shell alternately so as to disorganise the enemy and prevent him from returning fire with any accuracy. On the other hand, if our artillery is the weaker of the two, we should hesitate to suspend our fire until the very last moment, as it may always be possible to prevent the enemy from bringing things to a final issue.

With regard to the range for opening fire, Meunier cites instances to show that even shrapnel can be used effectively up to about 5,500 yards; but although circumstances may render this necessary, it is a dangerous experiment, if only because accurate observation, even with the best field glasses, is practically impossible at that range.

The preparation of the infantry attack should be left to the last moment, so as not to give too much notice to the enemy; but when once begun it should be most vigorous and decisive, the rapidity and power of modern guns being turned to full advantage. It should usually be carried out from the first positions the artillery takes up; in fact, no change of position should be made without being preceded by a rush of the infantry to obtain command of a new zone of security for the guns. Both will support one anothers advance; but that does not mean that they will advance side by side. Only machine guns can actually go forward with the infantry.

The Japanese artillery occasionally slackened off their fire, or ceased firing entirely, as the infantry moved to the assault, and the result was always a check in the attack. Meunier thinks that the accepted limit of 500 yards short of the target, within which artillery should not fire over the heads of their own troops, should be reduced to 200 yards; and that in order to avoid accidents, only percussion fire, this however, is not very effective against infantry; and Meunier's suggestion that flags should be used to indicate when the infantry have arrived within 200 yards, is also open to criticism. Could these signals be relied upon at such a moment?

With reference to artillery in retreat and pursuit there is little to be learnt from the late war, for the simple reason that pursuits, in the true sense of the word, were never made. The action of horse artillery with cavalry, on the other hand, was frequently illustrated. We have already made allusion to this in discussing the tactics of advanced troops accompanied by artillery. Cavalry was not held in reserve in the Manchurian campaign, as it had been in 1870; in both armies it operated at the front, though on the Russian side, from that prevalent but fatal tendency to adopt defensive tactics, which spoilt all their operations, it was kept on the defensive instead of acting vigorously as cavalry should. Cav-

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alry must operate on the flanks and rear of the enemy, and it requires the support of horse artillery in both cases. There is a mistaken idea among us that the functions of horse artillery will end by being the same as those of field artillery. They are widely different. Horse artillery would create a powerful and perhaps decisive effect in turning movements along with cavalry, and there its true work lies. It is of the highest importance that all their work in peace time should be a preparation for those battle tactics which are peculiar to cavalry in war.

Streffleur's Militärische Zeitschrift,

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Précis of Contents.

BY LIEUTENANT C. O. C. HUNT, R.F.A.

October, 1907.

The annexation of Dalmatia (concluded); by Col. A. G. v. Eichensieg.

The infantry combat in Italian highlands (to be concluded).

Medical recruiting statistics for Austro-Hungary for the period 1894-1905.

Austro-Hungarian military and soldier stories.

Foreign Military Intelligence.

FRANCE. Re-organisation of the higher artillery commands. The Algerian rifle regiments to be increased from 6 to 8.

ITALY. The sample Krupp battery has not proved altogether satisfactory; after firing 300 rounds the bores of most of the guns were found to be much scored; the mischief is said to be due to the loading. The 75 (3 in.) mm. gun, on the contrary was found to be absolutely intact after 2,000 rounds.

According to a communication from the Minister of War the cause is attributed to portions of the cartridge remaining in the bore; and the fuzing of the copper driving band. The first defect can be overcome by sponging out each time, and by enclosing the cartridge in other material. The depositing of copper from the driving band is caused by the very large percentage of nitro-glycerine in the Italian Ballistite.

RUSSIA. New regulations for the School of Artillery have been issued.

JAPAN. Winter training programme for recruits of the 3 Guard Regts.

Naval News.

The latest developments in torpedoes, torpedo boats and destroyers.

Technical intelligence.

A new detonating cap for gun cartridges has been patented in Austria which may be fired either electrically or by percussion.

An automatic device for indicating the number of rounds in the magazine of a repeating rifle: the user is enabled at any time, even at night, to ascertain the exact number of rounds remaining in the magazine by noting the number of small knobs, or buttons, projecting from the magazine, corresponding with the number of cartridges left: for every shot fired there is a disappearance of a knob; a full clip pushed into the magazine brings out all to view.

Supply and transport matters.

ITALY. New infantry equipment replacing the knapsack waterbottle, cartridge case, and tent poles by improved patterns.

Publications.

"The new 8 cm. (3·15 in.) Mark 5 Austrian field gun;" by R. Kühn (with 4 plates). Published by Seidel & Son, Vienna.

"The inner nature of the Japanese and modern offensive."

A physiological and psychical study of Japanese methods in the late war. By C.H.

November, 1907.

The defence of the fortress of Peschiera in 1848; by Capt. Czeike.

The infantry fight in the Italian highlands; by a Staff Officer.

Vindication of honour according to the Austro-Hungarian military code; by Dr. G. Lelewer.

On the use of motor balloons (dirigible balloons); by Lieut. R. K. L. v. Lilienbach.

Foreign Military Intelligence.

FRANCE. Re-Organisation of Cavalry

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divisions. The cavalry of Casa Blanca. Re-organisation of St. Cyr.

RUSSIA. New pattern grey green uniform.

JAPAN. Pacification of Formosa.

Naval Notes.

Japan's naval strength.

Some teachings of the wars in S. Africa and the Far East, on the attack on fortifications.

With improvements in modern armaments, superiorty of fire, and protection from it, lies alternately with the offence and defence. That the equilibrium is now again disturbed in favour of fortifications must be candidly confessed; before we can proceed with the further development of the attack. Fortifications; especially field works has assumed an unexpected importance, the latter owing to the short time required for construction has totally altered the state of affairs during the course of the battle, which can hardly be possible in the case of established fortifications. Yet even these have demonstrated their superiority over field works. Thus extremists have arisen, who in the defence would entrench themselves in line behind line; and in the attack would employ heavy guns and Saps against these trenches. Others follow the example of the ostrich; they won't admit results but explain away and belittle them with various reasons. Others take still other views and so on.

But it is all to no purpose. If a phenomenon is so striking and often repeated as these failures in attack, all students of history must know that the causes must be more general and deep seated. The question must be carefully approached, the known causes stated first; and then search made for others in explanation, sought for by following up results attained in practice. This is best accomplished by reading good studies on the subject.

Clausewitz's well known definition: "The attack is the weaker method with a positive object; the defence the stronger with a negative object;" might more correctly be rendered now by "the attack is the stronger adversary's way of fighting, defence that of the weaker (in numbers, quality or both); the offensive only can be decisive." The weaker has to minimise his weakness by fortification.

To-day, with the wide dispersion of troops, the small targets offered, masking and cover, many lines of battle, instead of a compact mass, fire tactics have vastly changed.

Even with modern permanent works, new ideas have full sway and everything is protected as much as possible and power is concentrated; at all events at the most important points.

Both field, and permanent works shewed how much progress they had made during both the Boer and Russo-Japanese wars. How then must the attack recover its lost ground?

Only by radical improvements in the means and methods of attack; by adaptation to the new situation by improvements in artillery and engineering; by the latters co-operation and their support of the infantry.

The attack on field fortifications.

Compulsory frontal attacks only are dealt with; it goes without saying that flanking attacks will always be made where possible. But against positions whose two wings rest upon natural or artificial obstacles, works, etc., and with the modern tendency of huge armies to increase their front, frontal attacks will probably become more frequent than of yore.

Against field fortifications a strong attack is the only thing possible, and is obligatory.

Now how is this vigorous attack to be prepared and carried out? In several ways.

1. By surprise, of which many historical examples are extant, but upon which it is needless to dwell.

2. Artillery, guns and ammunition, preparation by engaging the modern field works as targets.

Artillery, as both the last two wars have clearly shown, must avoid two extremes, which may be expressed as follows: "small shot must not be used against bears, nor sparrows shot with cannon."

The Russians committed the former error, when they bombarded fortified positions with shrapnel, having no common shell; these latter were held in much greater favour before the close of the war.

Even now shrapnel is looked upon as the principal projectile of the field howitzer, and even of the heavy artillery. But it must be admitted that the modern field work can easily be protected from shrapnel; even though only half a day can be devoted to its construction it may be rendered completely proof, together with firing trenches head cover and connecting trenches.

Shrapnel then, should be employed only with field guns; with light field howitzers its principal use would only be against troops behind light cover or bodies in the open; but these occasions would be few and far between, and even explosive shell would suffice for this. These will probably soon be the principal projectile of the field howitzer, at all events they must be used against fortifications; and the 4.72" and 5.88" howitzers may henceforth dispense with shrapnel.

The English, and still more the Japanese, have gone to the other extreme. Yet the case of "Lofty Hill" can hardly be considered as a solution of the question; the Japanese bombarded ordinary shelter trenches, for the most part not proof against field howitzer shells for a whole day, with 10.92 inch coast howitzers, firing common and finally reduced it to ruins; and this was only due to the ground being so rocky; had it been otherwise the effect would have been smaller. This undoubtedly shows, how few aiming points field fortifications present; in

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this its strength lies, and therefore demands not a few large, but a great number of, smaller yet sufficiently big shell.

What now is the proper calibre and the most advantageous type of shell? The latter (small shell) are distinctly the best against the present day narrow and deep trench with head cover and loopholes or light overhead cover. Stronger targets may be assigned to the heavy howitzers. To attack them is rendered very difficult owing to their being almost impossible to locate and a decisive result unattainable if no attempt be made to engage them. As a rule the cover will be light and easily destroyed and the men below and behind it reached. Here then neither shrapnel nor "mine" shell with delayed action fuze are called for but segment shell exploding on percussion and scattering segments as much as possible. Were these the only kind of targets met with, there would be no necessity for the howitzer to be of larger calibre than the field gun; but certain targets have stronger cover, demanding the use of certain calibre and bursting charge; such as buildings and modern obstacles. And it is only right to have a little reserve power. Obstacles must be regarded as penetrable only by means of artillery.

Taking everything into consideration, for a light field howitzer it is most desirable to have a calibre of about 3·73 in.; with common shell as the normal projectile (3 calibres long, 22 lb. in weight, filled with 3½ to 4½ lb. of ammonal) with medium thick brittle walls. These figures are not exact but sufficiently accurate. Against troops in the open, or partly or wholly concealed, or in motion, shrapnel is required and for special use against fortifications, a mine shell.

It is now no longer questioned that the field howitzer must be a mobile shielded non-recoil quick-firing gun, with a large ammunition supply.

There is a desire on the part of some critics for a smaller calibre than 4·13 in. on account of difficulties of construction in preventing the breech striking the ground on long recoil at high elevations. Variable recoil and displacement of the preponderance lead to complications and increased weight. The calibre thought most suitable is 3·54 in. As a consequence the number of field howitzers must be increased at the expense of the field guns.

Since the targets offered by field fortifications are fixed; and also for many other reasons it is clear that the artillery of the attack will operate against these from covered positions. Only exceptionally, as against a counter attack, will it be necessary for batteries to advance across the open. The artillery of the defence will also make extensive use of covered positions, but must more often expose themselves, especially in the later stages of the attack and therein lies the latter's advantage. Of course the defending batteries must be heavily bombarded before the attack and even during it the whole of the front except the actual point of attack must be kept under heavy fire.

The real (active) strength of modern field fortifications lies more in defence at shorter ranges, i.e. by magazine rifle and machine gun fire.

It must be made quite clear that with the conditions obtaining to-day that it is not single points which are to be bombarded, and stormed, but whole lines, or rather zones, often of very considerable extent. The objective point may be looked upon as defined laterally, but even here a width of a mile or so must be contemplated according to the lie of the ground and numerical strength. The zone will often, in certain circumstances, be from 100 to 400 yards in depth; and the breach, so to speak, in a field work must be as large.

To say that enfilade or oblique fire should always be used where possible is a common place that cannot be too much insisted on; and this is facilitated by the great range of modern guns. Under protection of the infantry pushed out to the front, the artillery of the attack, if not to begin with, can very soon approach to within 3,200 or 2,100 yards, and in favorable country even closer; protecting itself against enfilade by use of cover or echelon.

The whole artillery strength will be distributed over the entire corresponding front. Enfilading will hereby be all the easier; as in ordinary undulating country the hostile lines will not be straight but wavy. Outlying features are to-day more than ever the points to choose for the attack. Proportionately more difficult to enfilade are well sited cover trenches, easiest of all are connecting trenches. Field howitzers are especially suitable, as the width of dispersion of fire is appreciably less than the depth. A further advantage conferred by enfilade fire is that it allows a simultaneous artillery fire and infantry advance.

The observance of fire is of prime importance to artillery and though provided with the best of field glasses, the observers must at times accompany the infantry and be in telephonic or other communication with the battery, when attacking small and inconspicuous targets.

In speaking of the whole artillery action against fortification direct fire only is meant; sweeping fire will be exceptional and confined within limits; otherwise it is sheer waste of ammunition, certainly against such targets as field works.

Rifle trenches will be always kept under direct observed fire, especially while the defender's infantry are firing; but not so the shelter and connecting trenches. The fire trenches normally will be placed on the forward slope, the connecting trenches will lead upwards to the crest to where the cover trenches are situated; while the bulk of the defending artillery and the general reserves are still further back. But the chances of observation will be much smaller, if the fire trenches are either on or immediately in front of the crest. In this case observation stations to the front, and later to a flank, and telescopes should be used. Sometimes only a captive bal-

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loon will serve. Otherwise sweeping fire must be resorted to for cover and communication trenches, which should be strictly confined within limits according to ground communications &c., &c. It is frequently better at first to maintain a heavy fire on the chief target alone, the fire trenches, than to scatter ammunition.

But in the last war the fire effect of the attacking artillery was very small, in many cases; and the attacker still requires an additional weapon to complete the work of the guns: this would be met by very mobile light mortars like the field howitzer of 3·73 in. calibre; but whose principal projectile would be an explosive shell, for use against obstacles and overhead cover; together with common fuzed with T. & P. against trenches. This mortar would only fire at high angles with a maximum range of 875 to 1,100 yards; it would thus be quite light and portable. More attention must certainly be paid to fire at short range such as hand-grenades, as events at Port Arthur clearly proved; these methods of fighting have certainly to be reckoned with in the future.

These light mortars and observers would both be in the first line quite near the enemy. Consequently it is perfectly easy to see when and where explosive or common shell are wanted; co-operation with the assaulting infantry is at least possible and of course the accuracy of fire at so short a distance is greater than the best gun at 3,000 yards and over. To fight at close range, close range weapons are necessary. The light mortar is indispensable to supplement machine guns. Like the machine gun it would be attached to the infantry, to which it would lend great moral support, and not be grouped in batteries. The only difficulty would be the ammunition supply; but the same problem presented itself with regard to the machine gun and will like this, be solved.

Co-operation of the three arms up till the last moment.

The Japanese carried out this principle *in excelsis* and with self sacrifice: if fated to lose one's life what matter whether by hostile or friendly bullet; and if death in overtaking a few by the latter means, spared many from the former, the casualty list was thereby lessened.

Carried out in its entirety, close co-operation means not only that between artillery and infantry during the approach to attack, but between infantry and pioneers during the whole advance between artillery and the pioneers in making the breach and between all three in the final act.

How now is to be solved the question of the artillery continuing its fire during the whole progress of the attack without doing great damage to the assaulting infantry.

Many opinions have been expressed thereon not altogether satisfactorily. We must modify and improve upon the Japanese methods.

It is clear that the two arms can much more easily work alongside each other than behind; because lateral fire distribution is much smaller than that in depth. Therefore wherever possible enfilade. When behind each other high angle fire can be maintained longer than flat trajectory fire; and of course longest of all the light mortar fire right in front. In many cases when observation is practicable by reason of rising ground, fire may be continued during assault by laying further back so that first the trenches, then communication, and shelter trenches come under fire, and finally, should the range admit, the reserves. Under favourable observation conditions single howitzer batteries may accomplish this, especially when enfilading.

There is still another thing necessary and possible with frontal artillery fire.

Amongst other advantages the modern system of field works allows those occupying the trenches of the section under heavy fire to find relief by retiring laterally. The enemy may be induced to do this by the intense preparatory fire concentrated on the selected point of attack Then the fire is switched off from the centre to both sides of the breach, so that the occupants of the trenches cannot return and entry to the assaulting infantry is open. A wall of fire is erected on either side before and during the assault, which the defenders cannot pass. Common shell and percussion shrapnel would eb used.

This co-operation of artillery and infantry will not always be easy or possible; sometimes unnecessary. To make it possible the assaulting infantry must be clearly distinguishable by means of a sign to the artillery of the attack in rear, yet these signs must not also help the enemy. The Japanese white flags were insufficient in number and certainly not ideal. Perhaps each man might carry a distinguishing sign below his knapsack which would not be visible either from the front or when lying down.

Moreover the whole of the artillery does not continuously remain to the rear; the machine guns and the greater part of the light mortars follow the storming line at once and establish themselves in the captured objective. In especially difficult circumstances the advance is made now only by fits and starts and the whole zone cannot be captured at once.

Of course reconnaissance must always be the preliminary of an attack.

In favour of the above proposals is the fact that the field army's mobility is not impaired. In exceptional cases heavier howitzers will be required, against obstacles in mountainous districts heavy mortars.

(B). Attack against permanent works.

Port Arthur has clearly proved the impossibility of an attack by force upon the modern fortress. Such an attack can only very exceptionally succeed. Fortresses must be laid siege to, if they are to be taken; the time necessary therefore

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depending upon the defenders and other circumstances.

Now with regard to the artillery of the attack. This consists of the light and heavy ordnance of the field army, together with the siege artillery, the heavy guns for the destruction of solid cover. The most powerful of these is the heavy mortar and since Port Arthur a strong tendency has set in to increase the calibre, and with reason. Even the 24 cm. (9·44″) mortar is too weak in all respects.

The smallest projectile used should be an explosive shell 3·5 calibres in length, weighing about 375lb., with a bursting charge of 110 lb. of ammonal; fuzed up to at least 5 miles (8,800 yards) and only fired at high angles.

The principal difficulties are with the ammunition supply and platform; the latter will soon be designed and the first will perhaps be settled by considerably reducing the number of medium bore siege guns.

Perhaps the army corps of the besiegers might be armed with the field guns and mortars as already described in addition. These guns of course must be of modern design with the latest improvements, and except machine guns and light mortars formed into 4-gun batteries. Organised in this way its simplicity, mobility (by reason of the large number of guns) and practicability cannot be gainsaid. Further all guns must be shielded, and an enormous amount of work in the unwieldly attack batteries can be dispensed with, since all the attacking batteries are placed in position under cover and concealed.

In this way fortress warfare would at all events partly lose some of its tediousness in the future.

In view of this, the 28 cm. (11·02″) mortar is still not sufficiently heavy to batter the works and prepare them for the attack. A weapon for use at close range must be sought for; the light mortar being suitable, only against field works; against forts of course they would be useless.

Hitherto the only thing against permanent works was the mine. During the war in Manchuria something very reminiscent of the old Roman catapult was improvised to hurl bursting charges, this and other improvisations should stimulate us to evolve something more serviceable for the next fortress warfare.

As is well known doubts are continually expressed as to the feasibility of sapping and establishing guns within close range of the enemy, but the history of Port Arthur has shown what can be done. The construction of special Savartine guns, or mortars in the ground, requires further development and a maximum range of 900 yards with mine shells or bombs containing 220 lb. of ammonal should be attained with little difficulty; with percussion, either delayed or direct action fuze according to the nature of target. Light field railways might be brought into the trenches to carry up the ammunition. The attacker will of course lay these with due regard to the defender's works, so that they may be well masked deep and no broader than absolutely necessary, with good head cover. In spite of all that has been done so far in this way, it must be confessed that the art of mine warfare stands where it did in Vauban's day; except that then, troops thoroughly trained in the art were available; now owing to the neglect of it hardly any are forthcoming. In conclusion if the views expressed should appear too optimistic, phantastic or at best ill founded, let it be quite understood that they are merely honest attempts to approach the heart of the question.

Re-organisation of the Spanish Navy.

Technical News.

BELGIUM. The port of Brussels; the new canal connecting the city with the sea, through Willebroek, the river Rupel, and the Schelt, is expected to be completed in 1910. Work is still proceeding at Bruges and Bruges-on-sea on canals, docks, &c.

FRANCE. Marseilles is to be connected with the Rhone by canal nearly 4½ miles of which will pierce the Rove highlands underground; the height of the tunnel is to be 46 feet and 72 feet wide. Total cost £3,040,000, the tunnel alone £1,380,000.

RUSSIA. A canal to connect the Volga with the Don, is to be constructed.

Ballooning.

Supply and transport matters.

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"Journal des Sciences Militaires."

PRECIS OF CONTENTS.

By LIEUTENANT C. O. C. HUNT, R.F.A.

July, 1907.

Some thoughts on the Russo-Japanese war.

Chapter I. The influence of moral causes.

Chapter II. The strategy, including an account of the battle of Mukden. (To be continued). By General Baron W. de Heusch, Belgian army.

Napoleon's battle systems.

The turning movement. Battle on a central position. The battle of Rivoli, with maps and sketches; by Lieut. Col. H. Camon, *psc.*

Territorial recruiting; by H.A.G.

The French fleet in the Mediterranean and the army of Africa; by Capt. Sorb.

Military Pedagogy (to be continued).

Mounted infantry with cavalry and in front of armies (to be continued); by Capt. Besset.

The war of the Austrian succession (1740-48).

Operations on the Main (1st part of the 1743 campaign). The battle of Dettingen (continued).

Operations on the Rhine.

Retreat of the French on the left bank of the Rhine. March of the Pragmatic league army and final dispositions of the French (to be continued); by Major Z.

Military Notes of the month.

The new German Artillery training, would appear to be merely a copy of the French Artillery Regulations.

Re-organisation of the French garrison artillery.

Publications.

The naval campaign of 1805. Trafalgar. By Major E. Desbrière.

Theory of non-recoil guns; by Professor Rausen-Berger. Published by Bath, Berlin.

August, 1907.

The African army as a nucleus of a Colonial army (to be continued); by Capt. Sorb.

Looking Backward. Studies in military history of the XVIII. century.

The Staff. Officers employed in reconnoitring the country. The Q.M.G's. department of the staff (to be continued); by L. Hennet.

Routes into the interior.

Diary of a march route. 5th to 9th day (to be continued); by Capt. G.R. of the Artillery.

Military Pedagogy.

Part II. Tactical instruction and its aim with a represented and unrepresented enemy. The criticism (to be continued); by Lieut. E.M.

Road guides; by A.B.

The war of the Austrian succession (1740-1748).

Chapter III. Operations on the Rhine.

March of the Austrian army on the upper Rhine and of the Pragmatic army on Worms.

Attempts to cross the Rhine at Alt-Breisach and at Rheinweiler (to be continued); by Major Z.

The military month.

Events in Morocco, the mistake of "pacific penetration," the psychology of the native. Dirigible balloons and their use in war; as means of communication, transport, and reconnaissance.

Publications.

By the historical section of the General Staff.

The war of 1870-71.—The army of Châlons. — III. Sedan. Published by Chapelot & Co., Paris.

Preparation for military service; by P. Baudin. Paris: Hachette.

The Russo-Japanese war.

Tactical and strategical lessons by Major Loeffler of the Royal Saxon Staff, and translated by Lieut. C. Olivari. Published by Berger-Levrault & Co., Paris.

Questions of artillery tactics, with examples drawn from the Russo-Japanese war.

II. Col. Bielaieff's study. (Continued).

At the battle on the Sha-Ho the Russians used the new goniometer—an instrument answering to the director — with great success and were thereby enabled to bring deadly fire to bear upon the Japanese, to the latter's great discomforture, and this against moving targets: the writer enthusiastically maintains that the value of the instrument can no longer be a matter of doubt.

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Col. Sliousarenko in the depths of a gaol in plantation, from whence no aiming points were visible, took the sun as one; in this case all the officers' watches must agree with that of the brigade commander; they must likewise remember that the shadow moves ½ a division to the left for each minute—i.e. when firing from N. to S. After first laying on the sun, lines of fire may be set out. He draws the following conclusions:—

(i). Covered positions, even extreme cases, have proved perfectly suitable; and may be considered as consecrated by all the experience gained in action, and in certain cases confer enormous advantages.

(ii). The control of fire of batteries under cover may perfectly well be undertaken by B.C's. even when far distant from their guns—telephones, semaphore, chains of orderlies, &c., have stood the test as communicating mediums.

(iii). Indirect laying may now be regarded as the normal procedure, practicable in all cases, against any target under all circumstances.

Gen. Novikof, writing in the "Artilleriski Journal," gives it as his opinion that artillery in position, not only in the open, but behind only slight cover, will suffer heavy loss amounting almost to destruction; or will be reduced to silence until extricated by other batteries from its position; on the other hand abuse of these positions will entail many disadvantages; all authorities are agreed upon the principle of a judicious recourse to covered positions: when in the open intervals of least 30 yards should separate the guns.

(To be continued).

September, 1907.

General Desaix; by M. A. Chuquet.

Some thoughts on the Russo-Japanese war.

Chapter III: Strategy (continued).

The battles of Liao-Yang, Sha-Ho (to be continued); by General Baron W. de Heusch, of the Belgian Army.

The defence of the kingdom of Naples in 1806.

A Napoleonic study of the disposition of troops (to be continued); by Col. C. de Grandprey.

Looking backwards.

Studies in military history of the XVIII century. The Staff (continued). (To be continued); Leon Hennet.

Military Pedagogy. Part II. (concluded). (To be continued); Lieut. E.M.

The war of the Austrian succession (1740-1748).

III. Operations on the Rhine.

2. Events and military operations in Lower Alsace and the Palatinate up till September, 1743.

The Councils of war at Worms and Hochstetten (to be continued); by Maj. Z.

Q.F's with Field Artillery.

The present state of the question.

Part II. Description of materiél (continued).

BOLIVIA. Bolivia has adopted a field and mountain equipment made by the Schneider-Canet company; a trial mountain battery was ordered in 1905, this proved very satisfactory; the trail remained perfectly steady in action—this is probably the first equipment of its kind—and now further batteries are ordered including a field battery all of 75 mm. (3 in.) bore.

BULGARIA. Bulgaria has decided upon re-arming her artillery with Schneider-Canet guns and 81 4-gun 12- wagon batteries have been ordered. As long ago as 1897, three field howitzer batteries of 6-guns 15 cm. (5·90 in.) calibre were manufactured, they were rather of the nature of accelerated than quick firers. 4 to 5 rounds per minute.

CHINA. China has also adopted the Schneider-Canet model both for field and mountain batteries and like Bolivia placed an order for 6 field and 3 mountain batteries; each of 6 guns, 9 wagons carrying 600 rounds per gun with stores.

Each mountain battery will have 6 guns 600 rounds per gun will be carried.

The equipment is of the Q.F. type. The projectile is of 11 lb. weight with initial velocity of 984 f.s.: delivery of this was made in the beginning of 1906. Two more batteries are on order.

SPAIN. The Spanish field artillery has hitherto been armed with 3 different patterns of guns, made respectively by Krupp, St. Chamond, and Schneider-Canet; she has now placed an order with the latter firm for the supply of 200 guns and 48 wagons, &c., &c., to be spread over four consecutive years beginning with 1908.

For mountain guns it is proposed to go to the same firm, instead of Krupp as hitherto

GREECE. Greece has been carrying out experiments with the four following models:—

3″ Armstrong. 3″ Erhardt. 3″ Krupp, and 3″ Schneider-Canet. But no decision has yet been arrived at.

MEXICO. Mexico has also selected the Schneider-Canet pattern and in 1901, ordered 6 batteries of 6 guns, 9 wagons and 3 carts, harness and 400 rounds per piece, for use with horse artillery.

In 1902, as the result of tests the Mondragon-St. Chamond pattern was adopted for the field artillery calibre 3 inches, firing a 14·3 lb. shell with an initial velocity of 1640 f.s.: the equipment is Q.F.

NORWAY. Norway, one of the first powers to adopt the Q.F. equipment, having by means of a specially appointed commission chosen the Schneider type as the gun emerging victorious from the severe tests to which it was put, eventually placed an order with Erhardt in 1900 by reason of impending political events looming large. Subsequently events have nevertheless confirmed the superiority of the former's guns.

PERU. Two batteries Schneider-Canet.

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PERSIA. Eight batteries field, and four horse; Schneider-Canet.

PORTUGAL. Portugal in 1904 decided to order 36 batteries from the above firm; in 1906, modifications were ordered in the guns still undelivered. Portugal is thoroughly up-to-date in her field artillery.

She has now just had constructed an automobile 5·9 in. howitzer battery at Schneider & Co., intended for the entrenched camp of Lisbon, this fact deserves notice. Experiments with this battery have shown that on a good hard road, free from mud, a speed of from 3 to 3¾ miles per hour may be attained, diminishing to 1½ or 1⅞ miles per hour on slopes of 1 in 16, 1 in 20. On exceptionally bad or steep roads the engine must be anchored and the guns, &c., hauled on.

SERVIA. Servia has ordered 47 4-gun field batteries with 12 wagons carrying 750 rounds per gun.

Nine 4-gun mountain batteries, 100 ammunition carriers, carrying 750 rounds per gun; from the Schneider Co.

Military notes of the month contains:—

Employing the army as police.—Close co-operation between the military and civil authorities.

The grand manœuvres; marked improvement on previous years' operations.

Publications.

Military operations on the Sambre in 1794.—The battle of Fleurus; by Comm. v. Dupuis. Published by the historical department of the General Staff. Paris: R. Chapelot.

October, 1907.

Sinicæ Res.

Economic and moral evolution in the Far East and its consequences; by Gen. Chanoine.

Defence of the kingdom of Naples in 1806.

A Napoleonic study in the disposition of troops.

II. The disembarkation of the English and Reynier's defeat (to be continued); by Col. C. de Grandprey.

Tactical exercises (with map).

The weakness of the French colonial organisation (to be continued); Capt. Sorb.

Routes into the interior (for road marching); by Capt. G.R.

The soldiers of the Revolution. Chapter V. From a pacific propaganda to a war of conquest (to be continued). Lieut. J Diez.

Questions of artillery tactics.

Examples drawn from the Russo-Japanese war. Colonel Biëlaieff's studies.

The value of covered positions.

The proper conduct of fire of large artillery units, and the possibility of dominating the hostile batteries once silenced, will in many cases give certain batteries the possibility, not only of maintaining themselves in concealed positons, or even in the open, but to operate there successfully. The dangers of flanking fire, however, are sometimes very real and far greater than frontal fire, even though the concealment is partial; and against this neither height of cover in front, nor distance in rear of this crest, can avail.

Letters from Russian artillerymen give many instances in which tactical considerations have compelled the renunciation of covered positions perfectly suitable from an artillery point of view. The artillery cannot be reproached with failing to recognise the value of these positions and their advantages. On the contrary, it was with their fuller knowledge that they refused to shelter themselves, in order to achieve certain tactical results; and this has often proved a complete success. To quote one example: a Russian battery came into action so near the crest that the muzzles of the guns, and even the wheels were visible above the sky line; the first trenches dug proved useless because of the dead ground in front (3¾ miles), so others were made in front, thus reducing the dead ground to 1 mile, 4 guns of another battery were able to cover this from a flank.

Far from becoming a shambles the battery remained in action for 12 hours, under hostile artillery fire and expended 1,292 rounds, without losing a man. Many other parallel cases are quoted at Mukden and elsewhere.

Nothing is brought out more clearly than the fact that the best means of lessening artillery losses lies in its own fire; and that artillery in experienced hands will always, and under all circumstances, find a position corresponding to its mission.

In conclusion, it will perhaps be interesting to view the opinions of the principal European powers on this question of covered positions.

During the German manœuvres of 1904, it was remarked that "The artillery took position more frequently than before behind cover from view, behind crests or even woods, but often in full view." From conversations with German artillerymen one was impressed by the idea that the Russians were too prone to take up covered positions to excess.

The opinion appeared to be that artillery might be often placed in the open if it does not want to be far from its infantry and to renounce the idea of supporting it completely (in broken country it is essential that it should be within short range so that there may be no dead ground); it is generally agreed that shields are necessary for this.

During the war covered positions were much abused and as a consequence, artillery fire lost much of its effect on both sides.

(To be continued).

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CONTENTS.

Five Weeks in Hokkaido. By Captain C. R. Woodroffe, R.F.A. Communicated by the War Office. 317

"Journal des Sciences Militaires." Précis of contents, October, 1907. By Lieut. C. O. C. Hunt, R.F.A. 329

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Five weeks in Hokkaido.

By CAPTAIN C. R. WOODROFFE, R.F.A.

Communicated by the War Office.

We left Tokio on June 13th by the 7.30 p.m. express train from Ueno station, and arrived at Aomori, the most northern port of Japan, at 4.15 p.m. the following day.

Aomori:—

There is a European hotel close to the station, but as one could go on board the steamer at 10 p.m., it was only necessary to have dinner here. The thermometer had dropped to 65°, so that great coats were necessary, but one had been prepared for this by the great change in the country during the latter part of the journey, cultivation practically ceasing, and from the fact that snow was still lying quite low down on the surrounding hills.

At 10 p.m., we went on board the steamer, a very comfortable boat called the "Tagonoura Maru" (755 tons). Four first class cabins with two births in each, and a comfortable saloon, but no foreign food is provided. The temperature on deck was now 52°. These boats are not yet allowed to sail by night on account of the danger of floating mines, of which several are still said to be about. We sailed at 3 a.m., and by 8 a.m. were off the coast of Hokkaido, a little west of Cape Esau. Here a whale was seen spouting close under the lee of the shore. Steaming across Volcano Bay, we entered the Bay of Mororan soon after 3, and by 4 o'clock came to anchor just off the port of that name.

Mororan:—

The town lies on a peninsula on the east side of the bay, at the foot of the highest hill of the neighbourhood (550 feet). Landing just outside the railway station, we found the last train had left, and so put up at an Inn close to, called the Maru-Hon, where one is charged enormously, for very indifferent accommodation.

Idomo:—

A ri and a half along the coast is the village of Idomo, where we had been told there were plenty of Ainus, but on going there, we found that they had long since left, with the exception of a very few, and it is now nothing more than an ordinary Japanese fishing village.

First impressions:—

The two first impressions one gets on arriving in Hokkaido are the number of crows, and the terrible smell of decayed fish. I was standing on the shore watching some fishermen bringing ashore baskets of freshly caught fish. An old crow flew down, sat on one of the baskets, and after looking round, apparently not in the least frightened of the men, he seized a large flat-fish out of the basket and quietly flew off with it. The fishermen didn't seem to mind their fish being taken, this being probably because they catch such an enormous quantity. I noticed that there were baskets full of fish, far too small to eat, which are used for manure; and this I take it, accounts for the tales that the Japanese are ruining the fisheries, by over fishing and also by not paying any attention to season.

A Japanese "Basha":—

The next morning was cold and foggy, and it soon began to rain, but we left by the 5.50 train and arrived at Numonohata about 8 a.m. Here we detrained, expecting to find ponies which had been previously wired on for, ready for us; but, none were apparently available, and it had not occurred to the landlord to order a cart in their place, so that it was not until after 9.30 that we finally got started. A two wheeled cart for the luggage and a Japanese "basha" for ourselves. Even when the road is good, the latter is a most painful conveyance, but on a Japanese road, they are quite impossible; so that the traveller is warned that if there is ever a possibility of procuring a riding horse, not to be tempted with the offer of a "carriage." The seats are only a foot wide and made of board. The carriage is so narrow, that one's feet have to be almost under one's seat, and the height does not allow sitting upright. This road as far as Mukawa, a distance of 6 ri, is the worst, far the worst, I came across in Hokkaido and that is saying a good deal. Water a foot deep is lying in many places; there were ruts, the one bigger than the other, which the driver seemed to have a partiality for; and later on, one simply follows the shore so that the wheels sink up to the axles in sand. The road follows the shore in a N.E. direction through a continuous swamp. A great broad road about 25 feet wide, with ditches dug on each side—were it properly made, it would be excellent, but it has never been made, and no attention seems to be paid to it. At one place we came across some coolies mending it, but here they were only putting on peat, dug out of the swamp by the side, which, of course, in wet weather would only increase one's difficulties. Further to the right of one is the sea, to the left, great oak forests. Scarcely any habitation at all, and no cultivation of any sort. At 10.30 we reached the village of Yubutsu, formerly

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one of the principle fishing stations, but now simply a few insignificant houses, with a still more insignificant Inn, where the driver insisted on feeding his horses. This delayed us an hour, during which we shivered with the thermometer at 52°. After leaving the village the road crosses the Yubutsu river by a large double span iron bridge, passes some straw thatched cottages, and leads one through the same scenery as before until the village of Azuma is reached at 12.15 p.m. A good wooden bridge passes over the Azuma river, and after crossing two more small rivers by bridges, we reached Mukawa at 2.15. Nearly all the Japanese and Ainus whom we met on the way seemed to possess excellent 9 lb. saddles. They all rode. So that the advice to bring saddles seemed to be superfluous!

The native pack-saddle:—

The native saddle is rather like our pack-saddle, the rider sitting with his legs over the horse's shoulders, and leaning right back. He has usually a cushion (zaduton) to sit on, and there are no stirrups. The saddle only possesses a thin bit of string for a belly-band or girth, but is kept in place by a crupper which is of rope most ingeniously kept from chafing the horse, by the rope passing through a number of round pieces of wood, which being able to rotate, prevent all friction. Here we got rid of our "basha" and after much difficulty, having procured three riding ponies and a cart for the luggage, continued the journey to Piratori a distance of 7 ri. Leaving the village you cross the Mukawa river, the valley of which looks as if it ought to be capital for cultivation, the soil being rich and of an alluvial nature. The scenery changes, the road climbing over an oak covered hill, a tree here and there cut down, but otherwise virgin forest.

Saru River:—

After riding nearly 3 ri we emerged out of the forest and below us lay the valley of the river Saru, with the village of Sarafoto across the bridge on the far bank. Beyond the village are oak terraces similar to those we have just passed through; in the distance to our left, looking up the river, a high range of mountains stand up, its peaks covered with snow. To the right the open sea. The valley appears to be well cultivated, and one sees that the horse district has been reached, as brood-mares and foals are to be seen in all directions. Having given our ponies a feed at a house on the near side of the river, we turn sharp to the left, and follow up the right bank. The Japanese are getting scarcer and the Ainus increasing in number.

The Ainu's welcome:—

Here I made a mistake which is worthy of mention, so as to prevent others doing the same. The Ainu has a way of welcoming you by holding both hands out in front of him; and I, thinking that they were begging for money, got very annoyed. As one has now learnt, this is only a form of politeness, and an offer of money just at this moment, may hurt their feelings!

There is now cultivation on each side of the road, but it gets less and less as we go on, until after about a ri has been passed, it ceases altogether, and the forest is once more entered. In the cultivated part, one sees proof of the laziness of the Ainu. He doesn't take the trouble to take up the stumps of trees when he clears the ground; consequently a field of barley, say, loses quite ⅛th of its value, that amount of space being taken up by these tree stumps. One noticed several dead trees that had been "ringed." That is the Ainu method. Instead of cutting a tree down right away, they simply cut a ring round it, and wait until it dies and drops down by itself—a slow method. The road or track (a two wheeled cart can go as far as Piratori) follows a N.E. direction, scarcely touching the river at all. Several small Ainu villages are passed on the way, the chief one of which is Moipetsu, and after a ride of three ri from Sarafoto through most beautiful jungle, we arrived at Piratori at 7 a.m. There is a shorter way direct from Mukawa to Piratori of only 4 ri, but this can only be done on foot, there being no track for ponies.

Piratori:—

Piratori is the chief Ainu village of the island. It consists of one long street with houses on each side, which look well made, and the village appears clean. The houses are quite different from those of a Japanese. Built entirely of rushes, no windows, and doors of wood. Round many of the houses is a rush fence about 6 feet high. Inside, planks raised off the ground form the floor, and a hole in the centre is provided for the fire. There being no outlet for the smoke, it is almost unbearable for a foreigner; and is the cause, I am told, of the terrible amount of opthalmia whiich one sees among these people. The Ainu themselves seem to be an extremely kind and gentle race. The men are no more hairy than a fairly hairy European, but all of them wear long beards, which gives them a most respectable appearance. The women have quite good features, far superior from our point of view than those of the Japanese; but they make themselves hideous by tattooing their lips with a blue dye, which gives them the appearance of having a mouth stretching from ear to ear. Their language is entirely different from Japanese, but during my months stay amongst them, I didn't come across a single one who didn't understand sufficient Japanese to get along with. Their chief drawback is dirt. A bath is practically unknown amongst them, and I am told that the woman never take their clothes off at all. They are probably the dirtiest race in existence, hence the enormous amount of disease of all sorts one sees amongst them. It is worth remembering that it is quite impossible for a European to exist with them without taking his food. Theirs consists entirely of millet, and various kinds of seeds, even tea and rice being almost unknown. For full par-

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ticulars about this interestng but fast decaying race, one cannot do better than read "The Ainu and their folk-lore"; by the Rev. Bachelor, who is the only European who can speak their language, or who has really studied them seriously with a view to understanding them.

Journey to Okotnai:—

At the end of the village on the left hand side is a Japanese inn, kept by a half-caste. It only consists of four rooms, and when we were there, no food, not even fish was available. Putting up here for the night, the next morning having procured pack-horses for the luggage, we continued our journey up the river. The Ainu learns to ride as soon as he can walk, and one saw at once that they are born horsemen. The women ride "straddle-legged" just as well as the men, and in fact appear to be as good at everything as their male relations! They do nearly all the work. The river is crossed almost immediately. Too deep to ford, but there is a rope ferry, which can take four horses across at a time. It was a glorious day, so that a more perfect walk could not be wished for. The path mostly passed through great woods of oak trees, the undergrowth consisting of all kinds of grasses and reeds. The oak-leaves are enormous. One I measured being a foot long. I also noticed a giant magnolia, just beginning to flower. Lillies of the valley and wild roses just at their best. Now and then an Ainu village is passed, but as all the people are working in the fields, the houses show no signs of life at all. Our destination was Okotnai, a distance of 5 ri. The river has to be crossed and re-crossed four times, so that there is wading to be done, or else ponies should be brought. Pack-horses only should be used for luggage; as after passing the village of Penakori, which is a little more than half way, the path becomes a track only. By-the bye, when the far end of this village is reached, the track leading sharp to the left, down hill towards the river should be taken. Just before the village of Okotnai is one called Osatsnai, a name which when pronounced by an Ainu, sounds very much like the former, so that unless the traveller is forewarned, this may cause a misunderstanding. On arrival at the village, our coolies put the luggage down outside the biggest house which has one Japanese room, and said we could see it. It was horribly dirty, but as it would afford splendid shelter in case of rain, we took possession of it, according apparently, to the customs of the country! In the evening the landlady turned up; a quite good-looking woman—bar the dirt and tattooing—and as she didn't seem in the least surprised to find a foreigner in possesion of her house, but on the contrary, began to clean it up for us, one's conscience was clear! She turned out to be the widow of the head man of the village—the husband having been killed last year, by a poisoned arrow, whilst out bear hunting. The house is just as I have described before, on a little better scale, with the addition of a Japanese room, which is used by Mr. Bachelor, the missionary, the only other European who has been there. That night the thermometer fell to 36°, which considering it was June 18th, was surprising. This was the last occasion I was able to take the temperature, as on my return the following evening, I found that the quicksilver had been too tempting for the villagers during my absence, and there was nothing lett but the case and a few pieces of glass! The river was very high and fast, owing to the heavy rains of the previous week having rapidly melted the snow in the mountains. The path up the river follows the right bank, but leaves the river for about a ri, crossing a high wooded hill just beyond the village. When the river is low, there is a track right along the river on this side, along which I walked the second time I was in Okotnai, but it is always a little dangerous, and when the river is high, would be impossible.

The Ainu boat:—

The Ainu use dug-outs 12 feet long and 2 feet broad, for navigating the river. I lashed two together, and found that for coming down stream and shooting the rapids, it was excellent; but of course, they had to be taken up stream separately. Two men are needed to manage the boat. One stands at each end with a long pole, and if one of them is not an expert, one is very liable to be sitting in a boat full of water, although the lashing of two together, makes it impossible to actually upset, I think. We stayed at Okotnai three days, but as the river was too high to fish, and eggs were unobtainable, food began to run short; so on the 20th we decided to move further along the coast. Having sent the luggage off on pack-horses, and paid our land-lady the sum of 3 yen for the house, with which she seemed very pleased, we went down the river ourselves in two dug-outs tied together, and in three hours reached the ferry just above Piratori. The temperature turned perceptably cooler as we came down, Okotnai itself being well sheltered. The pack-horses didn't turn up for another hour and a half, most of them dead beat. They were all mares heavily in foal, and as the Ainu always insists on sitting on top of the luggage instead of walking, this was not surprising. I noticed on the road that both they and the Japanese in these parts, ride two on one pony. This is economical, and apparently a most successful way of getting about! Changing the luggage on to a cart, a walk of 3 ri along the same delightful road we had come up by, brought us to the bridge at the mouth of the river just before 7. Crossing this, we walked into the village, and found a comfortable little inn on the top of the rise, on the right at the far end. The following morning after a walk of 3 miles we came to Mombetsu, where riding ponies of sorts were obtainable at the Araki inn. The road as far as this takes one over a wooded hill very similar to that passed through on the other side of the river,

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until one drops down into the valley of the Mombetsu and reaches the village. From here the scenery changes. The forest is left far on the left, and one follows the road along the shore. On the right, the sea and sand dunes covered with scarlet roses; on the left fields and swamps full of blue irises and tiger lillies. The road is only sand so that the going for heavy vehicles would be impossible. At 10.50, having passed the village ofHai, which like Mombetsu, possesses a river not marked on the map, we came to a little river called the Ke-no-Mai. 11.40 found us passing Kabaki, a small village with a large rest house, and five cho further on, we reached Ampetsu, where the cart pony was fed and watered. On the road several Ainu fishing villages were passed, but the population on the whole is about half and half. The Japanese up here, like those in Manchuria, appear to be of the lowest type. All the rivers on this road are bridged by wooden bridges which are in a fair state of repair. The largest being that over the Achibetsu. Three ri from Ampetsu is Niikappu, our destination for the night. The walk takes one along a winding road up hill for some way, through the forest full of plants and trees of every description: the oak perhaps giving way to the ash. G'ant hazels which must be perfect in the autumn are everywhere, and now and then one catches a glimpse of the blue sea to the right; the whole effect being very much the same as that of the New Forest on a fine summer's day. It 'is a long three ri, but at last the end of the wood is reached and then the Niikuppu valley is seen below one. A broad well cultivated valley the river winding down the centre. Crossing the latter by the bridge and turning to the right, a distance of half mile brought one to the village, at the inn in the centre of which we put up for the night. The village stands exposed on the sea-shore, and the inn is very uncomfortable; but, as luck would have it, one of the officials of the royal horse farm between Niikuppu and Shibechari stayed the night there. He came to call, and was very kind; offering to guide us up the river to the house of one Furokawa, the Ainu chief, who he said would be delighted to put us up. He (the official) was a former naval officer, and the fact that one was English was enough to make him exert himself on our behalf. So, the next morning, we started soon after 8, and rode 3 ri up the river valley through most beautiful jungle in perfect weather. About half way, we forded the river and came to the village of Anesari. where Mr. Bachelor the missionary, has one of his Ainu schools. Apparently he is the only white man known in these parts! I had a chat with the schoolmaster—a Japanese christian—and saw the forty odd children of the school. All pure blooded Ainus who looked twice as intelligent as the average Japanese of the same age. The valley of the river is well cultivated, and houses are built on quite a new idea, on account of the cold. They have the appearance from the outside of an ordinary wooden house, being provided with an outer wall and windows. Inside one finds the Japanese rooms and mats as usual. Our guide told me that the total income of this valley amounts to 100,000 yen or 10,000 pounds per annum. It is certainly the most prosperous piece of country I saw in the Island. All the land we passed through was the property of the Imperial horse farm, which is 7 ri by 4 ri in extent.

Namiwaka. An Ainu horse farm:—

Mr. Furokawa, with whom we were on our way to stay, is a big Ainu horse farmer; as we learnt after travelling two more ri; for we suddenly came upon one of his horse stations consisting of huge stables made of rushes, and paddocks of post and rails. Crossing and re-crossing the river, we eventually reached our destination at noon, the first white people to go there, so we were told. Suddenly leaving the forest, one comes upon a huge well cultivated farm, the crops just coming up. The home buildings stand in a post and rail enclosure at the far end, consisting of the dwelling house surrounded by well built barns and paddocks. The house itself is a very superior Ainu house; the usual one room; but built on to it are two Japanese rooms, very clean and comfortable. Our host was away, but his wife, a charming blue-lipped lady, made us quite at home, and so under instructions of the official, we took possession. In one room there was even a carpet and European door, and to discover such a place in the midst of an impenetrable forest seemed too wonderful for words! He apparently built it for Japanese who ought to come to buy his horses, but don't!—and lives himself in the true Ainu dwelling next door. Just outside was a cage, in which a bear had been killed only ten days ago, and no less than 12 bears' skulls sticking on posts stuck in the ground. Around the house are beautiful grass fields; a sight one hadn't seen since one left England, many of the paddocks containing good looking English and American brood-mares. We stayed here a week, our landlady's kindness in doing little things for us, I shall never forget. She had a Japanese bath prepared for us, and even one night produced a present of a chicken, which appears to be a very rare bird in these parts. I was always wondering why the Ainu goes in so little for poultry, but Mr. Bachelor tells me that the reason is that the dogs, of which there are any number in every village, kill them all. One day I rode over to see my official friend at the Niikuppu horse farm. Leaving at 8 a.m., with a guide, on ponies, and accompanied by our host's son, aged 7, who rode a 14 hand pony with perfect ease, it took us two hours to cover the three ri. The track is very difficult, and leads through the thickest jungle; so that one could very seldom break out of a walk, although the Ainu's usual pace on horse-back is 6 miles an hour. Soon after 10 a.m., we came into the Shibetchari valley and were soon at the stud farm. It looks exactly

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like a large farm at home. Acres of good English grass divided into paddocks by post and rails, and rows of stables built of wood. At the office, in which, judging by the size of it, a lot of work must be done, we were received by Mr. Yamashita the head official and Mr. Midsumachi, the official in charge of the outside work. Having had the usual tea and talk,—it is impossible to hurry a Japanese!—a very excellent Japanese lunch was served, during which Mr. Kobayashi, my friend of the other day, turned up. It was two o'clock before we at last got a move on, and then their kindness in showing us everything could not have been surpassed. At first we looked at the yearlings, which were in sheds—the colts on one side, the fillies on the other. Round the sheds is a large post and rail fence forming a paddock, the entrance of which having been closed, the fillies were first let out, and then the colts. A good idea, as one sees them move naturally, and saves no end of trouble in leading them out separately. They were a weedy lot. All wanting in bone, and did not at all look as if they were destined to improve the quality of horse-flesh in Japan. Mr Midsumachi, a most delightful man who seems to know his business thoroughly, quite agreed that bone was lacking, but his argument was that the Japanese being a light race, it was not of the same importance to them as to us! An argument with a certain amount of sense. After this we walked round the broodmares, amongst which there were several very nice looking imported ones, and then found chairs provided on which we sat whilst the stallions were led out. They had 22 stallions in all, but we saw only 12. The pick of the lot was a fine upstanding Australian named "William." They import from all countries, but most of them seem to come from America, the Japanese being particularly partial to "trotters," although the result did not appear to me to be very successful! The ten best stallions which we saw first were two Germans (black), one Australian (brown) called "William," one English (chestnut), three Russian and one Hungarian (dark brown). One of the Russian ones was a great ugly brute which had been captured at Port Arthur, but the other two were good looking thoroughbreds, not a bit the type of the Russian horse one usually sees. We afterwards saw the stock of all of them, and that of these two Russians appeared far the best. The Japanese favourite colour is chestnut, and the officials told me they do all they can to get horses of that colour, as in the Japanese market, colour was the principal quality looked to by a buyer! We then moved on to another stable, and saw the three year olds (Japanese four year olds) that were to be sold in August. A very poor lot with the exception of the Russians mentioned above. The country, grass, and air, appears to be so perfect that I can't imagine any place more suitable for horse breeding. However the whole business seems to lack two essentials, (1) knowledge; (2) money. The farm is run on very economical lines, and the sum they are allowed to expend on foreign blood is very limited. Mr. Midsumachi seemed to feel this, but the other officials had not the slightest knowledge about horse-flesh at all—at least that was the impression they gave! Two points were distinctly noticeable. The two black German stallions are former carriage horses sent as a present by the German Emperor to the Emperor of Japan. A good looking pair for a Royal carriage, but useless for breeding purposes. However, it is the Imperial wish that, in order to please the German Emperor, these horses should be used as stallions, and so they are now bringing stock into the world, which is little if any better, than that which at present exists in the country. Secondly, the "rough-riders" that were put up to ride the stallions round a paddock for us afterwards, rode far worse than a new joined recruit. Had the officials had the slightest sympathy with horses and horse management, it would have been impossible for them to have willingly produced such an exhibition before a foreigner! After this, mounting some ponies, we went down to see the Shibechari river—a broad shallow river, formed by the junction of two streams about a ri above the farm. It is a favorite river for the Ainu to spear salmon in the autumn, fish of 50 lb. weight being caught in this fashion. We were pointed out a hill on which a bear was shot ten days before, and also a coal-mine on the opposite bank, where there is any quantity of good coal, they say, but for which there is little demand at present. Coming home through the village of Mori, we went and looked at their farm implements. One was surprised to find every kind of modern implement there, from a steam roller to a steam thrasher and binder—all of them made in America. It was now getting late, so returning to the office, and changing to our ponies again, having thanked them all for their most extraordinary hospitality, I returned to Namikawa, after a very enjoyable day. There are two very nice rooms built on to the office, where they were very anxious I should come and stay, but I regret to say that I was unable to make use of their kind invitation.

Ainu treasures:—

The Furokawas, being a chief's family, have probably as good a collection of Ainu valuables as one is likely to see anywhere. They were produced for my inspection, and I was surprised to find the quantity of old Japanese lacquer they had —very old and probably very valuable; although it has all been knocked about so, and is in such a state of dirt, that most of the bigger boxes are in a very bad condition. They are now used for storing their articles of diet in, such as millet etc.; but were originally given to the Ainu full of "saké" (the Japanese spirit), by the former Daimyos and their retainers in exchange for skins. One sees them in nearly every Ainu house. They

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still use the poisoned arrow for bear killing, although forbidden by police regulations; the quiver being carried across the back, supported by a broad band across the forehead, the way in which they carry all heavy weights. The garments they wear on swell occasions are made of the bark of a tree, ornamented with pieces of cloth sewn on here and there and are very picturesque, but like everything else, very dirty and smelly.

Return journey to Okotnai:—

We now decided to return to Okotnai, and as one wanted to see the absolute interior, made up our minds to cross the mountains and do the journey of 12 ri in one day, sending the luggage round by the coast road via Sarafuto. I don't recommend the mountain route to anyone who is not prepared for a very hard day! There is no road at all, and no one in the neighbourhood seems to have done the journey before. With one pack-pony and a guide, who said he knew part of the way, we started off at 7 a.m., and crossing the river just below the farm, a steep climb through the forest brought us to the top of the water shed between the rivers Niikuppu and Ampetsu. Following this for two hours, about 10.30 an outstation of the horse farm was reached. As far as here, the track is 2 feet to 3 feet wide, and I was regretting not having brought the remainder of the luggage. But one's regrets soon turn to joy as the journey proceeded! Following the bed of the Ampetsu for some way, we crossed it and then dived into the jungle, climbing hills, coming down precipices and crossing bogs. Now and then a kind of track was hit off, but most of the time was spent in forcing one's way through grass taller than oneself. Bamboo grass seemed very plentiful in these parts. Having crossed any number of small streams, at 12.30 we off saddled and had an hour's rest at one of them, the guide saying it would be the last we should meet for some time. The vagueness of the Ainu as regards distance and time is only equalled by that of the Japanese! During the last two hours, two natives had been met, but they had not the slightest idea of the distance of Piratori, and had never heard of Okotnai, whilst our guide now imparted the consoling information that we weren't yet half way! The day was very hot and stuffy, neither sun nor wind penetrated through the trees, except here and there when one comes to a large clearing which is sure to be full of horses grazing. Continuing the journey at 2 p.m., at 4 p.m., we struck the "Piratori" valley; so one naturally thought that this had some connection with Piratori; but it has none whatever. During this part of the journey the guide got badly bogged, and it was with the utmost difficulty we got him out. Turning due West—we had been going N.W. and N. up to now—and following the valley down for some time, we presently reached some cultivation, and also three cows, which appeared to be thriving well, but were a stranger sight in this country than a bear almost! The weary pack-pony shied and snorted with fear, when he saw them.

Numkibetsu. Nokapira river. Nioi:—

About 5 p.m., passing a small village on the left called Numkibetsu, we crossed the broad but shallow Nokapira river, and hitting off a road, came to the village of Nioi on the right bank, on the top of a high bluff. This village contained the most decayed lot of people, the like of which I hope I may never see again. The first house we came to, had a man with one leg, a girl with skin disease and a man who had almost lost his sight from opthalmia. Amongst the Ainu out of ten children one meets, at least three are suffering from this disease, but this was the first grown up man I met with it. Curiously enough it seems much more common amongst the male sex than the femlae They told us the distance to Piratori was 4½ ri, and to Okotnai only 1½, so the latter was decided on, and our guide now having become useless, an Ainu girl was obtained, who said she would show the way for 50 sen. Seeing a new Japanese house, built by a settler just arrived, I went to ask for some refreshment, and he produced the usual two raw eggs, which one always meets in Japan. The European traveller in Japan usually won't face this; but raw egg mixed with the Japanese "soyu," is quite pleasant to the taste, and a wonderful pick-me-up, when a man is really tired. Funnily enough, this Japanese had one leg also! We now started on the worst two hours of the whole trip. Passing some Japanese new arrivals, who were just building their houses, we climbed a tremendous hill to the west, and then went along the crest, through the thickest of undergrowth, until a perpendicular precipice was reached. Here the maiden was lost, and so halted and prayed to her God! However, we could now see that the valley of the Saru must be somewhere in front, and so scrambled, slipped and fell about, until a slope was discovered which was less steep than the others. This we descended, and it brought us down to the river just south of the village of Okotnai. Luckily the river was fordable here, so that our former dwelling was reached at 7.30 p.m., just before dark. The 30 miles having taken 12 hours. Our hosts of last week were just sitting down to their evening meal, and didn't seem overjoyed at the idea of one's spending the night with them! However, the landlady gradually cheered up and produced some salted "masu," the fish like a salmon grilse, which she cooked over the fire on two sticks—and very excellent it was! The process of cooking is simple. A long thin stick is stuck into the steak, the other end being placed in the sand, so that the meat is just over the charcoal. A tin of soup brought with us completed the meal, and having borrowed two of their "futons" (mattresses)—it was so dark that one luckily couldn't see the colour of them!—with our waterproof as covering, we lay down and didn't move

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until 8 o'clock the next morning. It looked like spending another night without our kit, but the cook turned up at 8 p.m., with all the luggage. Owing to the difficulties of transport, he had only been able to get as far as Ampetsu the first day, and so had done 30 miles the second day, a good performance when one considers the roads he had to travel by. Staying here until July 5th., we tried the fishing for Masu (salmon trout), but all the fish seemed to have run up the river, so that sport was bad. One day I went six miles up the river to the village of Ikeuri which is about one mile beyond Furenai on the right bank. The river is broad all the way, and one succession of rapids, but is navigable for shallow-bottomed boats, and very deep in places. It takes one hour and ten minutes hard walking to get back to Furenai. On the 3rd and 4th July it poured with rain, making all idea of moving out of the question, so I spent my time talking to the Ainus. A speciality of an Ainu village that I haven't mentioned before, is the number of dogs and the appalling noise they make. It's a special breed of its own, and looks like a "pi-dog" crossed with a fox. Long tail, pointed head and snout just like the latter. Every house possesses at least one, and the noise at night is too awful for words. They don't seem to bark—it's a dismal howl! If one starts, the whole village joins in, and the noise continues for some ten mnutes, then a lull and off they go again! The Ainu's food, as far as I can make out, consists entirely of millet, beans and barley, with now and then a little fish. They take neither tea nor rice. They are a wonderfully primitive race—no amusements of any sort—simply a state of existence from one day to the next. A very curious point is that they appear to know the value of money as well as most people. The prices they ask for everything being quite out of proportion to the value. A man won't take less than a yen for a day's work, the same sum having to be paid for a pony. Yet to judge from the simple way they live, a yen must last them a very long time. Most of the money , I take it, is spent on Japanese "saké" to which they all seem very partial. On the 5th we moved down to Sarafuto, following the same road we had come up by, and the next day Numonohata being the objective, putting the luggage on a cart, we walked 3 ri to Mukawa, where we hoped to procure ponies. Here they asked 1 yen 50 sen per pony which was ridiculous; but as the man wouldn't come down, I went and introduced myself to the police inspector and told him my complaint. He was a very fine specimen of a Japanese of the official class—in fact far the best I met, and struck me as being just the sort that they require to put that country in order. He said the price was monstrous, but that the people were very independent. However, he would get us a cart for 4 yen. Whilst waiting the usual time it takes for anything to be got ready in Japan, I had a very interesting chat with him. He said that the curse of the country was drink. All the Japanese take to it. Whilst he was saying this, a man of the farmer type came in; and shaking with fear, tried to explain why he should be given more time to pay the taxes that were due. The inspector gave him the best lecture on "drink" that I ever want to hear; and the calm and dignified way in which he did it, and the great effect it apparently had on the offender excited my utmost admiration. He acknowledged that the Japanese made very bad settlers. The Ainu, he said, were hopeless. They spent whatever they made on drink. I recommended "soap" as a cure. They are such kind hearted gentle people that I feel sure that a little kindness coupled with firmness would work wonders with them. The Japanese, on the other hand, seem to look upon them as beyond all hope, and don't move a finger to help them. Their one idea being that they should gradually die out of existence altogether! The cart at last turning up, the journey was continued and by lunch time we reached the small village of Azuma, where there is a most comfortable looking inn, but which had no guests and apparently never does have. It belong to a horse farmer named Kuzumaki, I found out from his younger brother, who is an Army vet. and was on leave when we were there. He very kindly entertained us, and in the course of conversation said that he thought the country would gradually progress; the great difficulty being that the Japanese look upon it as "abroad," and being used to hearing from their childhood the terrible tales of bears, cold and hardships, hate the idea of coming here. The Ainu, he said, are now to go to school exactly the same as the Japanese. This may be true in theory, but I'm positive that many of my little friends in the interior have never even seen the inside of a school-house! He also said that up to the present, it hadn't paid to keep cattle; but now that the Japanese were gradually becoming accustomed to eating meat, his brother and many others intended starting cattle farms. The grass, which is composed chiefly of clover and other foreign grasses, is well suited to the purpose, so that the cattle trade may help the country to progress more rapidly in the future than it has done in the past. After lunch we went on to Numonohata, arriving there at 4 p.m., and put up at the Arai inn close to the railway station. The landlord seemed a broad-minded, honest fellow, and was the first Japanese who has told me of his own accord that his people were cutting their own throats, by trying to make money quickly, and not thinking of the future. He instances two cases—that instead of spending time and money in manufacturing good articles, they make cheaply and quickly so as to ensure quick profits. The other is, that they cannot resist asking ignorant foreigners exorbitant prices. The consequence being that the goose that lays the golden egg is killed! When I arrived here, I wired to Mororan for my letters to

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be forwarded, as I had previously given instructions in Tokio for mails to be sent as far as Mororan. They arrived just before we started for our next destination Chitose early the following morning, which speaks well for the promptness of the Hokkaido postal arrangements. The local post-master gave one a deal of trouble by requiring a receipt for every single letter, but as the cart had already started with the luggage, and I could easily catch it up walking, the delay did not much matter. When at last the requirements of the postal department were fulfilled, we started on our journey and were shown a short cut along a line of light rails, which goes for a mile and a half across a vast swamp until it joins the main road. It is used for carting timber down to the coast, and as its breadth only just allows for the truck pulled by a horse to come along, and the coolies I met are the lowest and most dangerous lot I have met yet, the traveller is warned that the main road, although he will have to wade through water part of the way, is to be preferred. We met the cart just as we joined the main road, and from there to Chitose, one has a weary trek along a flat road with scrub oak forest on each side of one for about 5 ri. This is the main road from Mororan to Sapporo, but it is now very little used, owing to the railway having been built. We reached Chitose very hot and tired soon after one, and found a quaint old inn, very picturesque and of a kind one is not used to seeing. It reminded one not a little of an old coaching inn at home. Before the days of the railway, this used to be the half-way house between the two big towns; but now no one stays here, and it is more or less in a state of decay. However, the old landlord and his wife made us very welcome, and it is quite worth going to Chitose for the purpose of seeing him alone; as one gets a glimpse of what the former generation was here, and is able to realise what a great contrast there is between that and the present one! He is certainly one of the finest type of Japanese I have yet met—one of the old settlers that came over 36 years ago. He says that in those days there was plenty of money to be made by bartering "saké" for the skins of bear and deer with the Ainus. Bears were so thick then, that when walking through the forest, a man had to keep shouting to prevent them from attacking him. Deer were also very plentiful. Now there isn't a single one! The old man was at first very worried about our going up to the lake of Chitose (Shikotsu), as he said there was absolutely no place to live, and that the enormous number of coolies they have got at work up there, made it very unsafe. But, seeing that one was determined to go, he murmured that wonderful Japanese expression, "Shikata ga nai"; and saddling a pony, rode off four miles to interview a Government official, who was apparently all-powerful in the district. Later he returned in great spirits with a letter to the head man of the "Oji Seishi Kwaisha" ((Oji paper company) who are doing all the work going on up in these parts; so packing what stores we wanted for the trip in one box, and reducing everything to the lightest, we prepared for the morrow. July 8th was a lovely morning, and we intended starting at 7 a.m., but it was not until 8 that we got away. This was owing to it taking one hour longer to load pack-ponies than it does a cart. This one has learnt by experience, and it is worth remembering when arranging times for a start the night before. The landlord insisted on coming himself, as guide, and right glad one was he did. He seems to know everyone and everybody. The ponies he produced were by far the best I have seen in the country, and although we wanted to take a tent, he insisted that he would find some place to sleep in, and so putting ourselves entirely at his mercy, we started off. Chitose itself, like the other villages is simply a string of houses on each side of a bridge over the Chitose river. The river looks an ideal trout stream—rapid and level with pools here and there. However, it is so overgrown with trees, which in some places almost overlap, that I fear fishing would be almost an impossible operation. Crossing the river, we turned to the left and followed the left bank up stream for a couple of ri until a large clearing was reached, where there is a Government experimental fishery; so tying the ponies up we went and paid a call on the official in charge. He turned out to be a most obliging little man, who seemed heart and soul in his work, and he showed us all round the hatchery, which was most interesting. Everything is copied from America and appears to be in first class order, this hatchery alone putting over 1,000,000 salmon into the rivers of Hokkaido every year. Every "Ken" or county in Japan has its own hatchery, and were it not for these, he said, fish would soon become extinct. After a most interesting hour, we said good-bye; and with another letter in my pocket from him, telling all whom it may concern to do what they could for us, we crossed the river and followed a track that leads through the forest. After about 3 miles, pines both silver and ordinary begin to appear,—the first we had seen since we landed. At 2 p.m., another large clearing was reached, this time containing a match factory. The place is called Yuberi, and consists of a large number of sheds built of bark. The workmen seemed very busy cutting wood, this kind of pine being, I believe, especially good for the match trade. Here an amusing or perhaps I should say sad incident occurred. The old guide dismounted and without saying a word, ran down to the buildings in the gully below us. I thought he had gone to get a drink, so sat down and waited; but was just beginning to get impatient, when he came toiling up the hill with a large wooden box on his back. Behind him came an old and very respectable looking Ainu, blind drunk, and only prevented from falling over by a rope tied to a dog's neck on to which he

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clung with both hands. The dog, a kind of terrier, seemed quite used to it, and walked along in front, never letting the rope slack for an instant. I counldn't for the life of me make out what was going on; nor could the cook whom I called to my assistance. Then it gradually dawned on one that this wreck of humanity was to be the guide for the lake district. The landlord assured me that there wasn't an inch of the country this old man didn't know, and that although helpless at the moment, he would be perfectly fit on the morrow. We opened the man's "luggage" which the inn-keeper had so kindly carried up for him, and found it to contain one bottle of "saké," nothing else! The last I saw of him was starting off behind us, being hauled along by his dog, but as he never turned up, that final bottle must have been the last straw etc. It was indeed a sad sight. Surely the Japanese Government should take some steps to regulate the sale of drink to these Ainus, as it is from Japanese and not Ainus that it is bought. As far as my own experience goes, the Japanese from the highest official down to the lowest coolie look upon a drunk Ainu as a huge joke; and even if they don't reap the actual benefit themselves, take pleasure in giving them drink in much the same way school children at home give pigeons bread soaked in whiskey just for the amusement of seeing them roll about.

Trekking on through an apparently endless forest, now and then passing huge camps of coolies employed at sawing timber—a rough crowd, but of splendid physique,—we finally came to where the Chitose river leaves the lake, the crossing having to be done by a bridge of only three planks width, and very slippery at that. The lake was just in front, showing through the trees. The river water of a clearness its impossible to describe. Deep, yet every pebble at the bottom was visible. Here the luggage has to be taken off the horses, and carried over the bridge by hand, a feat which requires the skill of an acrobat! We got it over safely, piece by piece, whilst a coolie swam the horses over lower down. The luggage once over, the guide said I was to go on with him, and so leaving the coolie and cook to re-load the horses, we passed another large gang of coolies, and in about ten minutes came to the shore of the lake, which reminds one of Hakone. It is a beautiful sight. A huge piece of water, almost like a small sea—7 ri by 4 ri. To the S.W. the volcano of Tarumaid, to the W. Shiraoid, to the N. Eeniwad and behind us the oak clad hill of Mombetsu. They say the lake is one huge crater; the effect of this huge expanse of water surrounded by volcanos is a truly magnificent sight. Here we met an official, who did not seem particularly pleased to see us, and said there wasn't room for another soul. However, the old man was not to be beaten; so on we went for another half mile until we came upon a rough Japanese house, which appeared to be crowded, but luckily the policeman of the district, who happened to be there —he has to patrol this part twice a month —came to our rescue, and after a few words with him backed by the letter of introduction, we were offered and eagerly accepted one of the two rooms the house contained. It turned out to belong to the Oji Seishi Kwaisha, and as there were half a dozen of their engineers, who were prospecting, in the next room, a dozen of their underlings in the kitchen not to speak of a man with his wife and child, the official we had first met, had not been far wrong in saying there was not room! It was now six o'clock, but the old guide having deposited our luggage, started off quite cheerfully on his return ride of 15 miles. That evening was the only view one had of the lake, as the next two days it poured and the clouds were right down on the water. Beyond this house is one other small house belonging to the hatchery we had called at on the way up, and besides these two, there's not another building in the neighbourhood. It being impossible to see anything of the country, I spent my time talking to my fellow guests, who were all very kind and had been a long time in Hokkaido. They belonged to the Oji Paper Company, which has its offices in Tokio, but the factory is at Tomakomai, the station just below Nnmonohata, a distance of 7 ri from the lake. The coolies are employed making a light railway from the lake to the factory which will be complete in September, and after that the lake is to be used for making electricity, which will be taken along the same line as the railway. The quickest way even now to get to the lake is via Tomakomai, and there is a good road for carts. One of these engineers seemed well up in the railway system of Hokkaido, and gave me the following information, which is not shown on the maps at present available. The line from Asahigawa southwards is complete as far as Obihiro, and is to join up with the Tokachi line by the end of the year. From a place called Ikeda, east of Obishiro, the railway is to go north to Abashiri, and has at present reached Ashoro. The line marked on the map in the east from Chibeteha to Kotoninupuri had been taken to pieces and so is no longer in existence. They explained the reason why the main coast road towards Cape Erimo is so bad is because it is now little used, the part of the country in which we had been, being so scarcely populated. Emigrants and settlers go direct by boat to Kushiro; the province of the same name, being the most thickly populated in the country, next to this coming the province of Tokachi. In the afternoon, the weather clearing a bit, I went out on the lake, in one of the only two boats there. A primitive kind of "Sampan," rowed by a man sitting in the bows, who used two very narrow sculls, rowing one and then the other. An almost impossible way of getting along, except with the tide, as I soon found out—as, just as we got out of the cover of the shore, it was blowing so hard and the waves so big, that he got in a fright and tried to return, but absolute-

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ly couldn't make an inch; so there was nothing to be done but land a little way down the coast, whence one had a very rough walk over trees and rocks, there being no path of any sort. The following day was just as bad, but in the afternoon I made another attempt, this time in the hatchery boat, which is bigger and safer, to see the lake. There is no road round it of any sort, the timber coming right down to the water's edge. We again had to return owing to the weather, and finding a man with 4 pack-horses, who had just arrived with provisions and intended returning empty, I took the officials advice and commandeered him, as they said it was quite probable that we might be otherwise held up for a week on account of the weather. I should like to have learnt more about this part of the country, as the Paper Company having now taken possession, it is quite likely to become a busy centre, when the timber is once cleared, and communications opened up; but the official turned out to be right, as the weather continued so bad, that the forest the next few days would have been impossible.

The next morning at 7 o'clock, we said good-bye to our hosts and started off in pouring rain. The pack-ponies were, of course, on the other side of the river, so our kit had all to be carried across that slippery bridge again and it wasn't until 9 o'clock that we really started. Preparations are being made to build a more substantial bridge here which is a good thing, as I fancy, as long as people have to cross that river by the present one, visitors either Japanese or foreigners will be very scarce! The method of one man riding and leading pony, whilst the rest are tied "fore and aft" in single file behind one another seems to be by far the most practical way of using pack-ponies. We came down by a better way than we went up, and the thick forest protecting one more or less from the rain, the walk was quite enjoyable; we arrived at the Chitose inn at about 2 o'clock, the last mile or so, following the inn side of the stream which runs by it.

We found that the kind landlord, although nearly seventy years of age, feeling nervous about us, had started off that morning to bring us back. He returned at 7 o'clock in the evening, having had a thirty mile ride for nothing, but he soon drowned his sorrows in "saké," and the next morning was none the worse.

Hayake:—

The nearest railway station to Chitose is Hayake. The road in fine weather is good enough for a two wheeled cart, but after the rain we had had, we thought it advisable to run no risks, and having spent one more day at the inn, to give the roads a chance of drying, returned to Numonohata. It seems to be always necessary to have a pony for this trip; as even riding, I was wet up to above the knees! Having rested at the inn, I caught the 1.40 train for the north. There are no first class carriages and the trains are even slower than they are in Japan, but as the country was new, there was plenty to interest one. I might just note here that when travelling with a Japanese servant, I always gave him a second class ticket. This may sound foolishly extravagant, as many foreigners only provided theirs with third class. But I am positive that it pays in the long run, and by little kindnesses like this, which after all only makes a very slight difference to one's pocket, one gets twice as much work out of a Japanese. I say this, as one has so often met foreigners travelling who do nothing but complain about their servants, and in most cases find that the reason is that they treat them as something far inferior to themselves, the result being that the servant does what he thinks is just sufficient to earn his wages, and not a stroke more! The train after leaving Numonohata passes through a huge swamp for a while, then the scenery returns to the oak forest that one has now got so accustomed to, and then leaves the trees behind, the line enters a large fertile plain covered as far as the eye can reach with cultivation. As we went on, the country, as seen from the train, looked far more prosperous than that one had seen hitherto; in fact the crops in all directions seemed decidedly good. The stations appeared to be kept in order and the towns of Oiwake, Kuriyama and Iwamizawa have a very thriving appearance. As the train stopped at these various places, the carriages gradually filled and one couldn't help being impressed by the fact that the Japanese who got in, mostly business men or officials, looked one and all far more independent and well-to-do than their brothers in Japan proper. They all wore European clothes, and the most curious thing of all was, that these clothes seem to fit the wearer, and look as if they are made of quite good material. They must breed a different kind of tailor in Hokkaido to what they do in Japan! As we near Sapjoro, the cultivation becomes nearly all rice, which was naturally very backward. It is difficult to see how people can become good colonists who will insist on growing rice in a country which for five months in the year is covered with snow! At 6 p.m., Sapporo was reached, and the first thing one saw were beautiful baskets of strawberries and cherries being sold. It was July 14th, which shows one how much later this country is in its seasons!

Sapporo:—

Rickshaws were also in any quantity, and so chartering one, I drove down a fine broad street to the Yamagataya inn, about five minutes from the station, where I had to stay four days, waiting until a boat left Ataru for Saghalien. This inn is the best I have ever stayed in in Japan. It has 50 rooms but is quite quiet "geisha" not being admitted; and above all, they have a cook who can produce excellent foreign food.

The town of Sapporo is fully described in my guide books. Suffice to say, it was laid out by Europeans for the Govern-

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ment about 1871, I think; and its great broad streets running at right angles to one another, its green trees and grass, lack of smell and general cleanliness, make it a most delightful change after a year spent in Japan. The city was supposed to have been laid out due north and south, but the Japanese engineer who did the practical work, used his compass with the magnetic needle the wrong side of due north, consequently streets which should be due north and south are really north by east, and south by west. If one does not know this, one is rather apt to be puzzled about one's bearings when out walking here. Whilst here, I was lucky enough to see a lot of Mr. and Mrs. Bachelor, the well known missionaries. He has been 30 years and she 25 years at work in this country, and Mr. Bachelor is considered to be the only man who is an authority on the Ainu. He talks their language, which no one else does, and has written a dictionary. If fact he is the only living soul who has ever done anything for them. So that his views are very interesting. It is wonderful to see how the Ainus worship him. Even in the centre of Saghalien, where he has never been himself, and where no one since the days of the Russians, has been, I found his name sufficient passport to get anything I wanted done. They are devoted to the Ainu and say that they have given up their lives to them. But he added, "it is only a question of making their end easy, as the Japanese have now crushed them beyond all hope of recovery." He insists that the Japanese have been quite wrong in not educating them on the plea that they are "barbarians" and "it is no good educating them." He persuaded the Governor of Sapporo to allow the Ainu girls in his home to attend the Japanese schools as an experiment. This was done, and the result was that they did just as well, if not better than the Japanese, two of them even becoming "monitors" of the school. He has a home and school for them near his house. All his servants are Ainu, and he has even adopted an Ainu girl, having no daughter of their own. His object, he says, is not to try and revive the race, that is impossible. But to try and assist them to gradually get absorbed by the Japanese and treated as equals. They are easy to get on with, and one can make firm friends amongst them, whereas after 30 years residence in Japan, Mr. Bachelor says that he does not possess one single friend amongst the Japanese! Everyone tells the same tale! On Sunday evening I went to supper with them, and afterwards there was an evening service for the girls in the school, and the people in the home. It was delightful hearing them singing, very well indeed, our hynms and service in their own language, and it seems still more wonderful that a man can have learnt the language to this extent, when it had to be done all by ear, there being no writing of any sort to help him. On the 16th I hired a pony and rode out a distance of two ri to see the Macommanai horse farm, and was received by one of the officials, who very kindly showed me round. It belongs to the Hokkaidocho or "county council," and so is under quite a separate management to the one I went over at Niikuppu, which is the Emperor's private property, and is therefore managed by the Household Department. The farm appeared to be thoroughly well looked after, and the horses were far above the stamp of those I saw at Niikuppu. In fact, the horse management seemed to be superior in every way. The stallions were mostly American "trotters," a capital class to breed draft horses from, but not the best, probably, for improving the riding horse of the country. English blood is very scarce, but there was one very useful looking Australian, which looked as if he might be own-brother to "William" at Niikuppu. Besides these they have a couple of Australian "Clydesdales"—very poor specimens. It is a large farm—four ri in circumference, and the grass and crops all looked excellent. The cattle were "Ayrshires" and "Shorthorns." They prefer the former, and had a couple of very fine bulls bought in England. The pigs are "Berksaires" and the chickens "Plymouth Rocks." They all seem doing remarkable well. The dairy had not the cleanliness one is accustomed to seeing at home, but the butter looked and tasted excellent. I noticed that the dairy machinery was all English, the churn being the "Champion" make. The rest of the farm machinery comes from America. The hay both cut and growing was first class. Yet in spite of everything looking so well, the feelings still remains that they are only "playing at the game." Everything is carried out according to the letter of the book, there being no sign of initiative anywhere. When one considers that this farm has been going for thirty years, it can scarcely be regarded as a new toy; and the small way in which it has been copied by private individuals during that time, makes it appear doubtful whether the Japanese will ever make use of the enormous advantages which a country like Hokkaido offers to a farmer. From here I rode another three ri, partly along the road I had come and then branching off to the right, after crossing the big bridge, went to see a farmer who had a horse for sale which I thought might suit me. The country one rode through introduced one to quite a new Japan! Hedges, market-gardens, dairies, and fruit farms. Most of the houses semi-European, and the whole giving one an idea of general advancement.

Officers' horses:—

On returning to the inn, I was just in time to witness the arrival of 53 officers, who were doing a "staff-ride." One couldn't help noticing at once the immense contrast between the quality of their horses, and those one is accustomed to see in Japan. They were perfectly mounted; and what is more, their horses looked in splendid condition and well

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looked after. If one may take what one saw, as specimens of the mounted branches in Hokkaido, it is here that we must journey to see the best of the Japanese cavalry and artillery. The difference was remarkable!

My steamer being a day late, I had to put in another day at Sapporo, so it wasn't until the 9.30 a.m. train on the 18th that I left. Sapporo contains no shops where one can get foreign goods, with a few exceptions. For instance such a thing as "quinine" or "Dr. Brown's chlorodyne" had never been heard of, although the sign "foreign medicines sold" is up over several chemists. The train for Otaru passes through swampy forest until Zenibako is reached, which is about half-way. Thence the line follows the shore, passing through a few insignificant tunnels, and one reaches one's destination an hour and a half after leaving.

Otaru:—

Otaru is a dirty sea-side port, very much like any other. The chief impression being the disgraceful state of its roads, which must be almost impassable in bad weather. There is one shop where foreign stores can be bought and a so-called foreign restaurant close to the jetty where food of a sort can be eaten. The temperature at noon was 78°, and I judge that that roughly would be the average for the latter half of July.

Distances of travelled routes.

Given in Ri.—One Ri=2·44 English miles.

Mororan, 18·93 ri to Idomo, 1 ri 20 cho.
Numonohata, 2 ri to Chitose, 5 ri { Lake Shikotsu, 7 ri. / Hayaki, 4 ri.
Yubutsu, 1·8 ri to Tomakomai, 3 ri, Lake Shikotsu, 7 ri.
Azima, 2·3 ri.
Mukawa, 3 ri to Piratori. 4 ri.
Sarabuto, 1·1 ri to Piratori, 3 ri. { Penakori 2·5 ri. / Osatsunai, 4·5 ri. / Okotnai, 5 ri. / Nioi, 4·5 ri.
Sarumembetsu, 3·9 ri.
Kabari, 5 cho.
Ampetsu, 3 ri.
Niikuppu 1·5 ri { to Anesari, 5 ri. / Mukawa, 3 ri { to Government horse station, 3 ri. / Okotnai (mountain road), 12 ri.
Shibichari, to Government horse station, 3·3 ri.

Numonohata, 27·05 ri.
Sapporo, 9·02 ri.
Otaru.

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"Journal des Sciences Militaires."

PRECIS OF CONTENTS.

OCTOBER, 1907.

BY LIEUTENANT C. O. C. HUNT, R.F.A.

(Continued from page 316).

The Germans in general are of opinion that the idea that the fire of batteries in covered positions can possibly be directed without loss of effect is much exaggerated. They consider it most pernicious that the B.C. should be at any distance from the battery; nor do they put any faith in the various means of communication. So while admitting the advantages accruing from the use of covered positions, the Germans do not take an extreme view; the B.C. they think, should observe the fire within close reach of his battery.

French artillery authorities hold the following views:—

The B.C. should both observe and control the fire. The reverse slopes should be kept under fire. Indirect fire is now the rule for field artillery. The B.C's. of Russian batteries went so far to a flank to observe that they were obliged to transmit their orders by means of flags, which explains the small fire effect and the great expenditure of ammunition.

To sum up.

(i). Every kind of position—covered, concealed, and uncovered—as put forward by theory, has completely justified its existence in war.

(ii). The use of covered positions, or even only concealed ones, confers a great advantage in ensuring effect and safety of artillery fire; not only to the artillery but also to the other arms in conjunction with it. In consequence artillery is bound to know how to utilise cover and shelter of all kinds; and must utilise it directly there is the least need of it when there is the chance.

(iii.) Artillery must know when to do without cover when circumstances demand—in particular its tactical mission—and to remember its motto "Act first, take cover next" never to follow the dangerous, though seductive, "cover first, even if action suffers thereby."

(iv). As to preparation, artillery should study and carry out the use of all kinds of positions. Above all there is a danger of accustoming artillery to "seal pattern" positions. The choice must be inspired by, and conformable to, the object to be attained.

(v). G.O's.C. and officers of other arms should be made familiar with every kind of artillery position and with their properties. General officers should distinguish between the object aimed at (its mission) and the means of carrying it out (artillery technique) in the question of artillery positions.

Chapter III. Col. Bielaïeff's conclusions.

Artillery should from the very first strive to get into action at long* range, i.e. within at least 3,800 yards to 4,600 yards. Should tactical considerations however prohibit this, or the terrain require (if for example there is no good position within long range nor means of getting there under cover) it is perfectly admissible for artillery to act at ranges between 4,100 yards and 6,000 yards.

Similarly it is equally logical to go to the extreme range for shrapnel when using a longer fuze than the adversary. Since artillery fire is effective up to more than 3,700 yards it will not as a rule be necessary, as formerly, with the old field artillery materiel, to rush forward a battery on to a forward position to accomplish a mission begun on a rearward one. The exception being when batteries are detailed to accompany troops in an attack or aid in repulsing an assault. Then everything must be risked, even the loss of the guns, the only consideration then is the absolute necessity of acting in close co-operation with the infantry.

In general it may be laid down that the fewer changes of position made in carrying out the mission the better. But as of yore, it is nevertheless essential to have recourse to this to enable artillery to fulfil another mission.

At first sight the Manchurian campaign would seem to point to the use of long range. But as been shown above, that the bulk of the artillery should not be at ranges greater than 4,600 yards during the fight.

The effects produced by the artillery of the army in Manchuria do not at first confirm the theories enunciated in previous articles with regard to the maximum range of artillery; and the engagements of the Russo-Japanese war afford a multitude of examples of the action of artillery at ranges enormously greater than that looked upon as a maximum.

In brief the Russian artillery employed the various ranges as follows:—

At the beginning of an action fire was opened at very long range, from 5,250 yards to 5,800 yards and over. The principal artillery fight took place at these ranges, and were never modified on their own initiative. It was only when the

* According to C.T. called long range for F.A. guns.

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Japanese infantry took the offensive which caused the Russian artillery to alter the range; and the advance of the enemy often led the Russian batteries to fire at very short ranges up to firing with "case."

In nearly all the actions at the beginning of the campaign, artillery replied to the distant fire of the hostile reconnoitring batteries.

At Vafangu, the artillery fight took place at 4,650 yards: at Taschi-Chao, at the extreme limit of the fuze; certain Siberian batteries almost at percussion; at Si-Ho-San at nearly 5,800 yards, &c., &c.

The most frequent ranges were those at 3,450 yards to 5,600 yards.

On the Japanese side the tendency to enter upon the artillery fight at enormously long ranges was the same; together with absence of effect to reduce them.

All this leads to the conclusion that the ranges of the modern artillery fight are enormously increased in comparison with those of previous periods, and that action is entered upon at practically extreme range: the principal artillery fight takes place at distant shrpnel range 4,650 yards to 4,600 yards, as a rule against the hostile artillery.

But surely this teaching of the war is fallacious; and these deductions if adopted as bases of instruction would lead to dangerous and erroneous training of the artillery.

The Russian field artillery had a shrapnel shell with a fuze longer by 580 yards than the Japanese. This circumstance together with the distinct numerical superiority of the Japanese artillery from the very first, and the incontestable ballistic superiority of the Russian gun, naturally induced the Russian batteries to open fire at ranges beyond reach of the enemy's time shrapnel, but at which they themselves were able to use it; with a fair chance of doing damage to the enemy.

On the other hand the Russians had no common shell: and the Japanese artillery, well knowing the superiority of the Muscovite shrapnel and its great range, had reason to keep out of range of time shrapnel, so as to be able to use their shimose shell while only being under percussion shrapnel fire.

In cases where Russian batteries came under concentrated fire they suffered horribly, and this further encouraged them to engage at long range. Probably the same thing happened to Japanese batteries in a greater degree under Russian shrapnel at effective ranges. All this influenced long range fighting.

Moreover, as can be easily imagined, the conformation of the ground, often decided the range quite independently of the foregoing considerations.

That this fondness for long ranges has grave disadvantages is certain as for example.

(i). Firing at long ranges prematurely discloses artillery and thus affords the enemy most valuable information.

(ii). Artillery cannot obtain rapid and decisive results. Not bringing about the enemy's destruction, a partial success only is possible; nor does it impress either "gunner" or foot soldier with their real power.

(iii). Firing at long range has been one of the causes of an excessive waste of ammunition. Kuropatkin, time after time issued instructions to lessen this, insisting upon the difficulties of replenishment.

(To be continued).

The war of the Austrian succession (1740-1748).

III. Operations on the Rhine.

4. The armies in winter quarters.

The campaign in Alsace (1744). Military preparations of the belligerents.

1. The Austrians plan of operations. (To be continued). Major Z.

Military news of the month.

During the recent autumn manœuvres in France, the supplies of the 18th army corps were carried by motor trains. Each day a convoy started from Bordeaux, where the park was located, with bread, corn, meat and groceries, to places and at hours indicated by the G.O.C., A.C. The manœuvre area being 62 miles from Bordeaux, the motor wagons were unable to return to the park every day and were deflected to places outside the area to pass the night. The whole experiment proved a great success. One drawback must not however be lost sight of; in war it would not be easy to collect the necessary vehicles and chauffeurs thoroughly qualified professionally and also possessing the requisite moral calibre to face the incidental risks. There would always be means whereby an unreliable man could evade uncongenial duties, such as tampering with the mechanism, tyres, &c., to prevent this only to well known men should motor vehicles be registered and certain conditions complied with in their construction. The Swiss already have the system in force; where in return for certain stipulated advantages given them the A.C.S. (Auto-Club Suisse) guarantee to supply competent chauffeurs to the army in war. These volunteers enlist for four years during which time they undergo special courses of instruction.

Military Publications.

"Joan of Arc as warrior." A military study; by Gen. F. Canonge. Librairie Nationale, Paris.

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Reports, Precis, Translations, Etc.
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CONTENTS.

" Mitteilungen über Gegenstände des Artillerie-und Geniewesens. Précis of contents, by Lieut. T. C. Newton, R.F.A. 331

" Russian Artillery Journal." Précis of contents, August, 1907. By Lieut. E. Clayton, R.G.A. 338

" Journal des Sciences Militaires." Précis of contents. By Lieut. C. O. C. Hunt, R.F.A. 339

Conclusions drawn from the Siege of Port Arthur. By the German General Staff. A Précis from " Rivista di Artiglieria e di Genio," June, 1907. By Lieut. H. de Watteville, R.G.A. 341

" Revue de l'Armée Belge." Précis of contents. By Lieut. K. B. Ferguson, R.G.A. 342

The " Spectateur Militaire." Précis of contents. By Major E. P. Smith, R.F.A. 343

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MITTEILUNGEN ÜBER GEGENSTÄNDE DES ARTILLERIE- UND GENIEWESENS.

Precis of Contents by LIEUTENANT T. C. NEWTON, R.F.A.

No. 12, of 1907.

Essays.

"On the question of a rangefinding instrument for use in war"; by von Niesiolowski-Gawin, Captain.

"Russian views of the employment of Field Artillery" (with map); by Capt. L. Wltavsky, from Russian sources.

The choice of open and covered positions, according to the circumstances under which the artillery has to act.

(Conformation of the ground, the adversary's position, distribution and position of own infantry, information about adversary, etc).

General Remarks.

Artillery positions fall into two categories.—Covered and open positions.

The necessity of keeping the artillery in a condition in which it can carry on the fight for as long as possible obviously requires a covered position, for this alone can ensure the invulnerability of the artillery. Yet in practice war has shown that—however desirable it may be for the above reason to take up covered positions—yet open positions have often been used, have had to be used, and further often will be used.

It is therefore just as idle to assert that in future field artillery will practically only occupy covered positions, as to say that they will nearly all be open positions.

It would be more correct to say that field artillery will even in the future occupy positions of both sorts almost equally often; the covered positions being taken up chiefly against the hostile artillery, the open ones chiefly against infantry.

The fact is, that wherever the tactical conditions admit of it and the ground makes it possible, the artillery must make every effort to take up covered positions.

To choose a position correctly one must be absolutely clear as to the task required of the artillery. The position must then be chosen with regard to the task, taken in conjunction with all other known circumstances—especially the position of one's own and of the hostile infantry.

In war the greatest difficulty lies in choosing and forming an opinion on a position. Absolutely no attention was paid to this question in Russia during peace. Nobody had ever thought of troubling to think about the choice of a position. At the practice camp they were usually already marked out with flags and the practice reduced to shooting in the narrowest sense of the word. The technical side of shooting, even out of covered positions, presents no great difficulties: the difficulty is, correctly to choose and form an opinion about the position, especially if this has to done quickly.

Covered Positions.

When is a position to be regarded as completely covered?

We may say as a practical rule, when the covering crest is at least 4 mètres above the line of sight of a gun laid on the highest point of the position occupied by the enemy. With a less height of cover the enemy will see the flash of discharge or the dust raised by the shock of the explosion.

The chief advantages of a covered position are:—

1. Ranging on, and therefore also the silencing of, guns under cover is made more difficult—in fact often absolutely impossible—for the enemy.

2. All preparations for the opening of fire can be made in absolute security.

3. A covered position allows freedom of movement in so far as it makes it possible to change position quickly and easily at any moment without being noticed.

Against these advantages we have the disadvantage, that part of the ground in front of the cover cannot be fired upon at all by the artillery under cover.

The amount of dead ground permissible will in war always be one of the chief factors in the choice of a position.

The choice of covered positions in the defence.

In the defence covered positions are usually chosen for the fight with the hostile artillery.

In choosing a covered position, the first question to settle is, how much dead ground can be allowed?

As already stated the covering crest must be at least four mètres higher than the line of sight of a gun laid on the highest point of the position occupied by the enemy, if the position is to be completely covered. To get such cover, it will often be necessary to reckon on about two kilometres of dead ground.

This amount of dead ground, viz. two kilometres, can be roughly regarded as

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"the admissible limit" of dead ground for a covered artillery position, for modern rifle fire will prevent the enemy from advancing in great masses at a range of two kilometres, and up to this range will bring effective fire to bear on what for artillery is dead ground. It can be laid down as a general rule, that the artillery is powerful at ranges over 2 kilometres, the infantry on the other hand at ranges under 2 kilometres; the shorter the range,, the more powerful the infantry becomes.

It folows that the nearer defence will be left to the infantry and machine gun detachments, while the artillery shells targets at ranges over 2 kilometres—usually the hostile guns, to prevent them firing at its own infantry trenches.

And this last is the most important matter, for modern rifle fire is so effective, that any attack on infantry in shelter trenches which are still intact and not under artillery fire will always be repulsed.

If, in consequence of the conformation of the ground, the artillery in covered positions will have more than two kilometres of dead ground, it will be necessary to place part of the artillery in the open. In general, part of the artillery must be placed in the open, if the enemy are expected to make a vigorous attack and one's own infantry position is a weak one. If this is not the case, the near defence may safely be left to the infantry, and in this case part of the artillery need only be placed in the open for the near defence if there is a surplus of artillery present.

If the artillery does not allow the hostile guns to destroy its own infantry lines, and if it is further able to draw the fire of the hostile guns on itself, or to silence them, then one may safely say that all attacks of the hostile infantry will be repulsed.

To be able to choose a suitable covered position it is very necessary to accustom the eye to judging the height of the cover. This requires a great deal of practice. As judging by eye without sufficient practice is likely to be very inaccurate, it is a good thing to use special appliances for this. For instance, a suitable instrument is a clinometer or level, such as has been applied to Aubry's rangefinder, and is adapted for gauging the height of cover. In distributing artillery in covered positions, the general dispositions are of importance.

If the batteries placed under cover are able to bring the ground in front of their neighbouring batteries under fire, and thereby mutually to reduce the zone of dead ground down to two kilometres, then there is no necessity to place a part of the artillery in the open, and the zone of dead ground in front of single batteries may be even as much as three kilometres.

The connection between the different covered artillery positions is shown by the mutual shelling of the dead ground in front of different batteries. The organising of this connection is the duty of the commander of the artillery of the section in a section, and of the higher artillery commander in several sections.

In a mountainous district or in country intersected by gullies, deep watercourses, etc., the batteries can undoubtedly mutually keep the dead ground under fire, but can never also command the gullies etc. For this purpose special (two gun) sections must always be brought into position.

Artillery positions immediately behind the crest, so as not to be completely under cover—the so called half-covered positions—only combine the disadvantages of covered and open positions, and can therefore be disregarded.

For example on May 3rd 1904, 24 Japanese guns placed behind the crest of a hill in a half-covered position—only the flash of discharge was visible—were completely silenced by six Russian guns placed completely in the open. (This will be referred to later in speaking of open positions).

Trenches for the detachments must be dug in half-covered positions just as in open positions, otherwise the artillery will be annihilated in a very short time.

If the conformation of the ground is such as to give more than two kilometres of dead ground with completely covered positions for the batteries, it always seems preferable to have part of the artillery completely under cover, and part in the open, than to take half measures, and place the whole of the artillery half under cover behind a crest.

Everything stated above for the defence is equally applicable to the attack. In war the attack and the defence are very intimately connected, and a failed attack immediately becomes a defence. Therefore even in the attack it is desirable for the batteries under cover not to have more than two kilometres of dead ground, though this consideration is essentially less important in the attack than on the defence.

The shooting of the 3rd battery of the 4th East Siberian Artillery Brigade from a covered position on 13th May 1904, in the battle of Zinjschon. (See sketches 1 and 2).

The battery at 6 a.m., on the 13th May, took up a position entirely under cover on the shore of Chonuesi Bay north of Talienwan which had previously been specially reconnoitred. The artillery in the forts in Zinjschon had been firing since 4 a.m. The fire was directed entirely by means of the dial sight (goniometer), the centre peak of Mount Samson, 7 or 8 kilometres away, being used as an aiming point.

The fire was observed from a place immediately behind the covering crest, this crest being about 250 metres in front of the battery.

The orders were transmitted by word of mouth by means of two connecting files. About 30 metres behind the battery was a dry watercourse, 3 to 4 metres deep, which afforded the detachments cover from the hostile fire when necessary. Chonuesi bay, lying in front of the battery did not

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allow the Japanese to approach within at least three kilometres. Taking this distance as the admissible amount of dead ground, the battery position was chosen completely under cover, about 250 paces behind the crest in front, immediately behind a mass of rock about 10 metres high. The guns were 10 paces apart, the fire was carried out by half batteries. This was found to be better than firing with the whole battery; even at critical moments a sufficiently high rate of fire could be kept up. At 6.30 a.m., fire was opened on the Japanese artillery placed in the Chinese forts; the flank of this artillery was turned towards the battery. Behind the hostile artillery a large crowd of men and horses could be seen. The whole Japanese position was clouded by a light mist, and it was difficult to distinguish exactly what the crowd moving about near the Japanese artillery was. (Angle—298).*

Hardly had the Russian battery opened fire when the Japanese were seen to be heliographing, and soon afterwards the Japanese battery on the opposite shore of Chonuesi bay opened fire. This battery had the correct direction of the Russian battery at the very first shot, this being due to the signals of a Chinaman posted on a hill behind the Russian battery. Fortunately the Chinaman was caught soon after the opening of fire by the battery clerk Golub and made harmless, before the Japanese had finished ranging by means of his signals. The first few rounds fired by the Japanese fell near the battery, but all the rest fell a long way behind it. The Russian battery switched their fire from the Japanese artillery in the Chinese fort to this battery (angle 307), and silenced it in a short time.

Half an hour later this Japanese battery again opened fire, but this time only with three guns. It was then finally silenced with two rounds of battery fire from the Russian battery. (The Japanese guns were in the open, and no trenches had been dug for the detachments!). When the mist finally cleared, the Japanese artillery in the Chinese fort were no longer visible; one could only see a number of limbers and horsemen retiring behind the mountain. After a few rounds of battery fire there was nothing more of this target to be seen but a few riderless horses galloping about.

The Russian battery then immediately switched its fire on to deep infantry columns which could now be seen advancing from Mount Samson (Angle 290—298; range 4—5·2 kilometers). The shrapnel fire of the battery very quickly made these columns retire behind Mount Samson. The Japanese batteries, which were placed under cover of undulations of the ground and were invisible to the Russian battery commander, tried in vain to reach the Russian battery with their fire. Most of the rounds went over the battery high up in the air, and a great many of them burst in the village of Lindjaten, half a kilometer away.

Soon after 10 o'clock thick Japanese infantry lines were seen lining the watercourses 3½ to 5 kilometres in front of the Russian battery (angle 249—260). The battery immediately opened fire on them. As soon as the first shrapnel burst, the skirmishing lines rose, began to run, separated in all directions, and soon only a row of black points could be seen. A great number of these black points remained lying on the field. The skirmishing lines could be seen first running towards the village of Madjaten, and then back again so as to retire behind a hill. It was quite easy for the Russian battery commander to fix the position of the skirmishing lines at any moment, and to switch effective fire on to them. The Japanese infantry reserve was also scattered by the fire of the Russian battery.

As the Russian battery was completely under cover, the Japanese artillery could not range on to it. The watercourse behind the battery position afforded protection against the hostile searching fire, which occasionally made itself felt. Although the Japanese Artillery fired at least 1,000 rounds at the Russian battery, only one man was wounded. The battery itself fired 728 rounds.

Conclusions.

1. The completely covered position of the battery made it possible to fight the hostile artillery with few or no losses, or to ignore it and fire on the hostile infantry.
2. Firing by half-batteries has shown the ample powers of four quick firing guns and proved the possibility of keeping a moving target under effective fire from a covered position.
3. The zone of dead ground of about three kilometres could in the above case be left without any special protection as the position was inaccessible to the enemy.

The shooting of the 1st half-battery of the 3rd battery of the 4th East Siberian artillery brigade from a covered position on 14th July, 1904.

On the 13th, 14th and 15th July, 1904, this half-battery took up a position on the road near the Kote 275. About 10 metres in front of the battery was a wide, deep gully. The interval between guns was seven paces. The observation post was on the mountain behind the battery, and in consequence of its high position the observing officer could see over all the ground in front, into the valleys and even into several gullies and deep watercourses. The peak of a mountain about 30 kilometres away in the direction of the village Chuchai the other side of the bay was used as an aiming point. The heights about 400 paces to the left and 800 paces in front of the battery covered the position from sight even from the Japanese observation posts established on the

* All the notes of the readings of the dial sight, the angles given, etc., are still existent, and make it possible to give an accurate picture of the whole artillery fight.

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heights of the rocky peninsula. The shortest range at which the guns could fire over the hill in front was 2,400 metres. The position commanded from the Kote 241 on the border hill on one side to the village Schipo inclusive on the other side. i.e. fire could be brought to bear on the whole of the plain in front of the left wing of the Russian position.

14th July. At 5.30 a.m., the Japanese batteries in front of the village Intschensu opened fire. Kaoljan masked the guns well; at first only the flashes could be seen from the observation post of the battery. Later it became possible to distinguish the guns accurately with glasses, and even to see the movements among the detachments. The Japanese had brought up more than 50 guns near the village Intschenshu, and placed them in groups of six and twelve guns. The twelve most easterly guns could be seen plainest and were therefore fired at. On account of the height of the observation post the points of impact of the rounds and their errors in range and line could be very easily seen. The mean range was about 4,800 metres. After a few rounds of battery fire the group of 12 guns was silenced. After about an hour this group again tried to open fire with the flank guns, but was finally silenced by the Russian half-battery with a few rounds of battery fire. These guns had no trenches for the detachments, and this was the cause of their being so quickly silenced.

The Japanese batteries immediately in front of the village Intschensu were placed in two lines, very well masked by the Kaoljan, and had shelter trenches.

The range varied between 4,400 and 4,800 metres. The goniometer readings and the ranges for each battery were determined; the fire was at first by salvoes. But when the observing officer discovered by means of his telescope that after the shrapnel had all burst, the Japanese detachments quickly left their shelter trenches and carried on the service of the guns, the method of fire was altered so as to catch the detachments at their guns.

Towards 3.0 p.m., about 20 horsemen were seen moving in single fire on the road from Intschensu to the village of Schipo. A round of rapid fire (range 4,800 metres) brought down two riders and one horse, the rest of the riders turned about and galloped away back in the direction of the rocky peninsula.

In this connection it should be mentioned that after one day's firing the eye became so accustomed to the use of the director in determining the Japanese position that—as in the above case—the correct range and direction could be given for the very first salvo or round.

The practice against infantry detachments was very difficult as the infantry hid themselves directly after the first salvo. The half-battery fired altogether on three infantry detachments, but the results could not be ascertained.

Towards 4 o'clock fire was opened on the village Intschensu. Searching fire was used. One of the Japanese batteries immediatly by the village Intschensu opened a very hot fire against the Russian half-battery. However a few rounds of battery fire soon silenced it, and the Russian half-battery went on firing at Intschensu without the Japanese guns opening again.

The bombardment of Intschensu had an immediate result; the infantry columns and supply train there retired at once in the direction of the rocky peninsula.

In consequence of the well chosen covered position, the Japanese could not range on the half-battery and in spite of the great number of rounds fired, no one was wounded and it was able to continue its fire through the hottest fire of the Japanese artillery.

The half-battery fired more than 1,000 rounds, and successfully carried out their task of commanding and defending the plain of Intschensu.

The amount of dead ground which was necessary to give the half-battery complete cover was 2·4 kilometres. This was however permissible, because their own infantry positions were very good (the infantry had been occupying their trenches for more than a month, and were well accustomed to their use) and the near defence could be safely left to rifle fire alone.

It is true that the 2nd half-battery of the 3rd battery could bring fire to bear on the approaches to the position of the 1st half-battery from their position behind the hill Kote 108; but this had no influence on the admissible amount of dead ground, because the gully leading to the position of the first half-battery from the hill Kote 108 could not be fired into at all, and the Japanese would have been able, if no rifle defence had been available, to advance right up to the 1st half-battery in absolute security.

On the whole—as already stated—a mountainous and deeply intersected district makes the mutual support of the batteries more difficult.

The shooting of the 1st half-battery on the 14th July clearly showed that the success of the artillery fight depends not so much on superiority of the number of guns as on good selection of the position.

Open Positions.

Every position in which the firing artillery is visible to the enemy—whether the gun itself, or only the flash of discharge, or the dust thrown up by the explosion is visible—is called an open position. If the guns are so placed that the enemy cannot see them before the opening of fire, the position is "masked."

Fire from open positions is usually only directed at visible targets. Command is easy, as the orders are given in the position itself.

As artillery firing in the open is visible to the enemy, ranging against it is usually very easy, and it follows that it will suffer very heavily if exposed to hostile artillery fire. In order to minimise the losses, shelter trenches must be dug near the guns for the detachments.

But even then artillery placed in the

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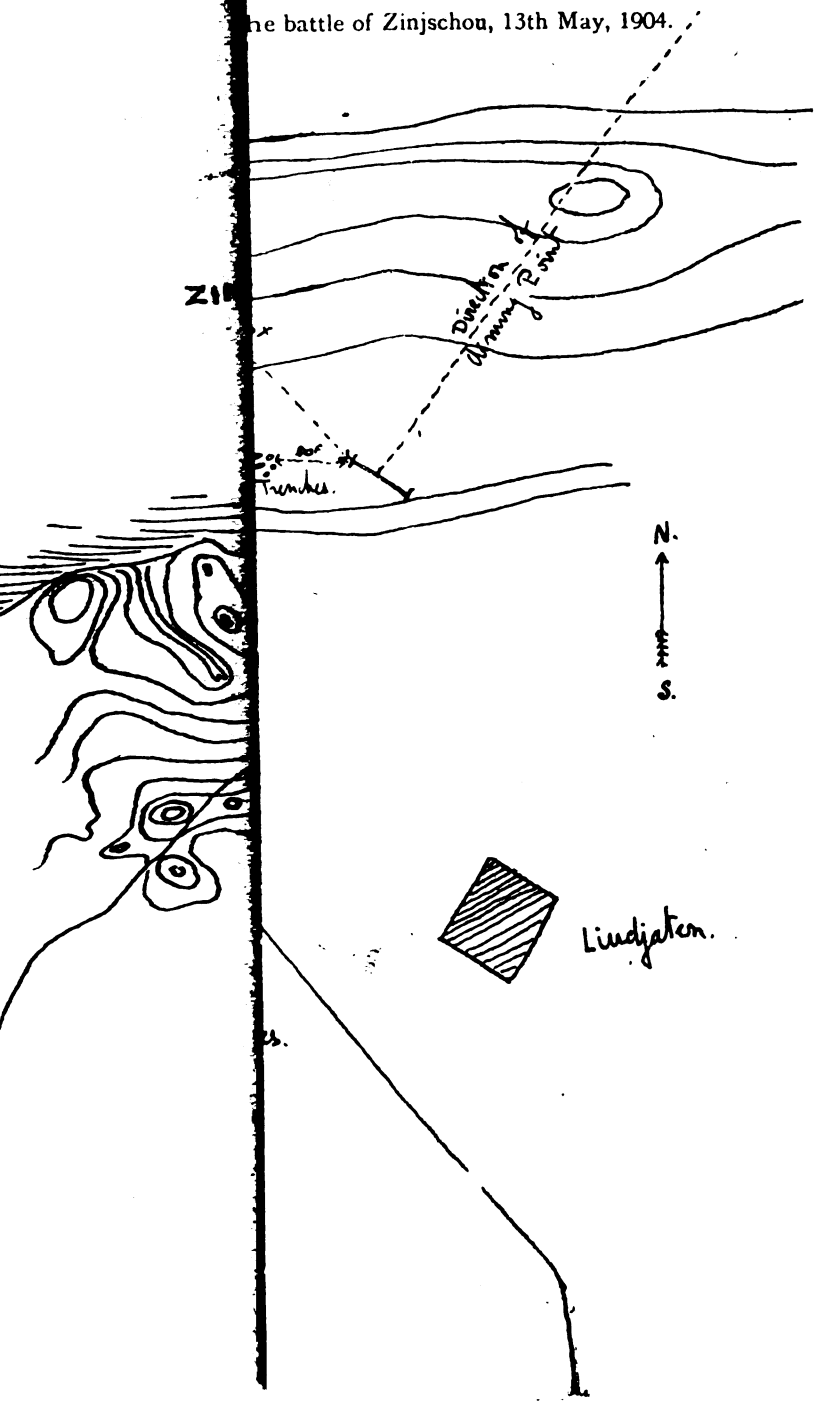
[To face page 334.

SKETCH No. 2.

d Battery of the 4th East Siberian Artillery Brigade,
he battle of Zinjschou, 13th May, 1904.



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open will not always be able to fire "when it wants to," or "when it considers it necessary," but rather "when it can possibly do so," or "when it is able to."

That is to say, at the moment when the hostile artillery begins to fire on artillery in the open, the latter will have to cease firing, and its detachments will have to seek safety in their shelter trenches; otherwise this artillery will be annihilated within ten minutes.

By occupying an open position the dead ground in front will be reduced to its smallest limits, or disappear altogether.

The fire from open positions will be chiefly directed against the hostile infantry, and only in exceptional cases against the hostile artillery. Artillery in the open will only be able exceptionally to undertake a change of position (when the enemy possesses no artillery at all, or it has already been silenced; or when the position is just on or behind the crest of a hill, and the guns can be withdrawn under cover behind the crest).

Examples of the occupation of open positions.

(From the preliminary battles round Port Arthur).

I. On the 2nd May, 1904, 6 guns of the 3rd battery of the 4th East Siberian Artillery Brigade and the 14th East Siberian Rifle regiment received the order to march northwards and occupy a position near the village of Schisalitesa, north of the town of Zinjtschouson.

Near this position the battery met a battalion of the 5th East Siberian Rifles returning from the outpost positions. The battalion commander Lieutenant Colonel R., informed the battery commander that he had been ordered to get into touch with the enemy, and that now that he had got touch with the enemy he was marching back into camp to his regiment. (The Lieutenant Colonel's idea of getting into touch with the enemy is typical!).

Soon afterwards the battery met the mounted "Jager" detachment of the 14th East Siberian Rifles returning from outpost duty, and heard from them that the enemy was about three kilometres away.

As it was already getting quite dark, and the road was bad, added to which the advanced troops had retired from their positions, the battery bivouacked near the village of Tunsalison, about 5 kilometres short of the position they had been ordered to take up.

At daybreak on 3rd May the battery continued its advance together with the 1st battalion of the 14th East Siberian Rifles. The information about the enemy was as follows:—"Infantry columns visible; the Japanese have no artillery, or at the most 1 or 2 guns."

In view of this information the battery occupied at 7.50 a.m., a position in the open, facing north, west of the village Schisalitesa, with the 1st battalion of the 14th East Siberian Rifles on its left.

The commander of the whole force was Lieut.-Col. D., commanding the 3rd battalion of the 5th Rifles.

Japanese columns showed themselves on the hills north of the battery, and fire was opened on them at a range of 4,400 metres. The hostile columns disappeared as soon as the battery opened fire. Towards 10.0 a.m., Lieut. Colonel D., received the order, delayed in transit, to bivouac with the 3rd battalion of the 5th Rifles on the position near Zinjtschuson. Although the fight was in progress, this field officer carried out the order and drew off his battalion to Zinjtschuson. Thus the left flank of the Russian position was left completely exposed.

The battery commander took over the command of the force. Towards 11 o'clock a request arrived from the commander of the advanced foot "Jager" detachment of the 14th East Siberian Rifles for ammunition, and also, on account of the pressing of the Japanese, for support. The ammunition carts were sent to him, also a section of two guns. The rifle fire kept getting hotter, and soon a Japanese column appeared, which was trying to turn the Russian position. The battery immediately changed its front and opened fire on the column, which thereupon quickly retired. The range was 3.400 metres. After this there was a complete lull.

Towards 12 o'clock a shot was heard from the north-east; the shell fell 20 paces in front of the battery; the next round went over it. The Japanese guns were not visible; only the flash of discharge could be seen and from this it appeared that they were ranging with two guns. The Russian battery opened fire immediately. When the two Japanese guns finished ranging, 10 more guns joined them, and later on two more batteries of 6 guns each. Thus the Japanese gradually brought 24 guns into position against the 6 Russian guns. The fight lasted less than half an hour, and by that time all the officers had been several times wounded and only two or three men were left at each gun. It was impossible to continue the fight, and so the order was given for the limbers to be held in readiness. The fire of the battery was made as rapid and powerful as possible, and the detachments exerted themselves to make every possible effort, for it was clear that the retirement of the battery depended on this fire. The positively frenzied fire soon silenced the Japanese guns and the battery was able to retire without being molested by the Japanese. 583 rounds were fired at ranges varying from 3,400 to 3,700 metres.

Conclusions.

From this example it is seen that the Russian battery only took up an open position on the strength of the information that the Japanese had no Artillery.

Up to 12 o'clock all the Japanese attacks were certainly unsuccessful—for the Infantry showed itself powerless against the Artillery fire. But the situation soon changed when the Japanese brought up 24 guns into position against the 6 Russian guns. Although the Japanese guns were silenced—in consequence of their

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half-covered positions and the accurate Russian fire—the battery had to retire from its position and lost all its officers and 30% of the men.

Probably the 6 Russian guns were able to keep the upper hand of the 24 Japanese guns because the Japanese brought their guns successively into the fight and thus enabled the Russian guns to overwhelm them successively.

It is clear that in fighting in an open position the artillery will suffer heavy losses and—if no shelter trenches are made for the detachments—will be annihilated in 10 , or at the most 15 minutes. It is therefore absolutely necessary, in occupying an open position, to dig shelter trenches for the detachments. These admit of carrying on an intermittent fire, as the detachments are kept concealed in the trenches, and—at favourable moments—opening or continuing their fire. Thus it becomes possible in certain circumstances to endure the hostile artillery fire from an open position, and with greatly superior numbers of guns even to carry on an artillery fight.

II. In the battle of Zinjschon on 13th May, 1904, the whole of the fortress artillery was in the open; by 10 a.m., it had already been silenced. Only in No. 4 battery (see sketch 1.), a single unwounded gunner continued firing at the Japanese artillery group of 12 guns, which was in position near the railway line and was firing at the shelter trenches of the 4th and 8th companies of the 5th East Siberian Rifles.

The shots from No. 4 battery were so accurate that after each round one or two Japanese guns stopped firing. The Japanese therefore switched their fire from the infantry trenches on to No. 4 battery, and bombarded it vigorously. But whenever their fire against the battery ceased, and was directed against the trenches, the gunner fired off a round at the Japanese artillery and thus again drew their fire on himself. In this manner one single gunner prevented the Japanese from destroying the trenches of Nos. 4 and 8 Companies. (It was unfortunately impossible, in spite of every effort, to discover the name of this gallant gunner).

III. On 6th August 1904, a section of guns was sent by order of General Kondratenko on to the "division mountain," to support the defence of the "corner mountain," which the Japanese were attacking. As the Long Mountain and the Hill of the Dead covered the Japanese positions from the Corner Mountain, it was necessary to drag up a gun on to the ridge between these two mountains. The approach was very steep, and there was very little room, so that only one gun was put on this ridge. As soon as this gun opened fire on the very strongly occupied Japanese trenches opposite the Corner Mountain, the Japanese battery, which had been firing at the Corner Mountain, switched its fire on to it. At first a few Japanese rounds did not reach the ridge at all, and a few fell beyond it, but soon shrapnel began to burst over the gun, and cover the ground round it with bullets. The position of the Japanese battery was ascertained from the summit of the Hill of the Dead by means of the smoke rising from the gully, and it was possible to see exactly when each gun was fired. The observer on the Hill of the Dead warned the detachment at each round by the word "shot." As soon as the word was given, the detachment ran apart and hid behind the various rocks; after the explosion of the shrapnel they ran back again to the gun and carried on their work.

Although the bullets covered the whole ridge, not a man was wounded and the fire was systematically carried on. Each time the enemy's shrapnel burst, the men made jokes about it and fired off another round or two.

The Japanese infantry evacuated the positions they had taken up and retired to the Threeheaded Mountain, while the Japanese battery, after ceasing to fire at the Corner Mountain, went on firing more obstinately but without success at the gun placed in the open on the ridge.

In both the above examples, guns placed in the open have drawn the enemy's Artillery fire on themselves and thus essentially improved the situation of their own infantry without suffering seriously themselves.

Conclusions.

1. On 6th August the local conditions did not allow of the artillery's task being carried out from a covered position, and forced the guns to be placed in the open.

2. The firing of the gunner from No. 4 battery, and of the gun on 6th August, are both characterised by "not firing when one wants to, but when one can—not when it is necessary, but when it is possible."

IV. On 15th August 1905, the troops holding the advanced positions round Port Arthur retired on to the Wolf Mountain. The infantry occupied a long line of shelter trenches. These had been dug at the foot of the Wolf Mountain; there were no communications. Up till 17th July, Kaoljan, which blocked the field of fire, had only been mown to a range of 200—400 paces.

In several places the trenches were intersected by gullies which could not be enfiladed, and which might have allowed the Japanese to come right up to the trenches without being noticed. The trenches were also very narrow, so that any movement inside them was very difficult.

The men in the trenches could not see what was going on on Kaoljan. When the Japanese attacked them, they had to fire off at random in the direction from which they heard the click of the rifles. For the support of the infantry, part of the field artillery were brought into action completely in the open on the ridge of the Wolf Mountain. The 2nd section of the 3rd battery of the 4th East Siberian Artillery Brigade, established itself on the ridge behind the 2nd company of the 13th East Siberian Rifles. Their high

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position enabled this section to see the people moving on Kaoljan. The other six guns of the 3rd battery took up a covered position 300 metres further back against the hostile artillery.

Towards 4 a.m., 17th July, while it was still dark, severe rifle fire was heard below on Kaoljan. The darkness and the height of Kaoljan made it impossible to fix exactly the spot where the firing was going on. The severest fire seemed to come from just in front of the section.

Soon afterwards a few black specks could be seen on the slope of the mountain in front, slowly moving downhill: these were thick columns of Japanese infantry. The range to the mountain (as found on the day before) was about 2,800 metres. The section opened fire, and after a few rounds the black specks could be seen separating and rapidly moving down the mountain till they disappeared. Several such black specks could be seen on various parts of the mountain slope.

The rifle fire became hotter, and here and there—where the Kaoljan was not so close—Japanese skirmishing lines could be seen, thanks to their white flags standing out. The section fired without ceasing, and everybody worked as hard as possible, including the orderly, the battery clerk, and even the doctor. As it got light more and more Japanese skirmishing lines and reserves could be seen in every direction.

There were a great number of skirmishing lines; hardly had the section fired one or two rounds at one than a fresh one appeared, nearer and stronger. Day broke and the Japanese batteries opened fire on the section. But there was so much Japanese infantry all round them that a reply to the batteries was not to be thought of . . . . the hail of rifle and shrapnel bullets became hotter and hotter, and the noise was deafening. An orderly bringing the order to retire fell with a bullet in his head as he reached the guns. . . .

The last rounds were fired at a range of 800 metres. The Japanese artillery fire almost ceased, and only the rifle fire continued. As the section had no more rounds (they fired altogether 250 rounds) and it was obviously impossible to bring up fresh ammunition, they set about getting the guns down from the position. (The losses in this section were, 1 gunner killed: wounded, Captain Gobjato, 1 bombardier, 4 gunners and the clerk Golub. This brave man always hurried to his battery from the field battery office during a battle, and helped gallantly in the most dangerous places).

The defile by which the section retired was covered from the direction of the position just vacated. Hardly had the section retired than Japanese appeared on the crest of the ridge it had just left. The 3rd section which had been ordered by the battery commander to take up a position about one kilometre from the evacuated position, in order to cover the retreat, immediately opened a hot fire on the infantry appearing on the crest and drove them off it.

The skirmishers who had occupied the trenches in front of the artillery position, had already—on coming to the end of their ammunition—fled from their positions, so that the pursuit of the Japanese was only checked by the fire of the artillery, although the latter had to cover their own retirement. Thanks to the forethought and discretion of the battery commander, Lieut.-Colonel R., who gave the order at the right time to occupy a rearguard position, the artillery did not fall into the hands of the Japanese.

All the batteries of the 4th East Siberian Artillery Brigade retired under hot rifle fire of the Japanese.

On 18th July General Stoessel, gave the "antedated" order "to evacuate the positions on the Wolf Mountains and not to occupy them again." Thus a splendid achievement of the Russian Field Artillery was relegated to oblivion, and why?—Because only General Fock and his Chief of Staff and General Stoessel were responsible for the flight of the infantry. The former had the trenches badly placed, and the latter had forbidden them to mow an open space on Kaoljan round the position.

As the near defence was not made sure of, the Japanese were able to approach right up to the shelter trenches. The 6 guns of the 3rd battery, which had occupied a covered position, could then give no assistance. Two of the guns certainly tried to advance and take up an open position, but they could not drive up to it, and had to turn back.

Conclusion.

The more difficult and critical the situation of the infantry is, the more effectively must it be supported by the artillery. If the near defence is not made safe by rifle fire, the artillery must occupy open positions and take part in the near defence.

Conditions which make it either necessary or possible to occupy open positions.

If the adversary has artillery, open positions can only be occupied in exceptional cases:—

(a). If on account of the local conditions the task required of the artillery cannot be carried out from a covered position. (August 6th).

(b). If the hostile artillery has been silenced, or it cannot fire at the position chosen on account of the ground. (August, 9th).

(c). If the zone of dead ground of the covered position is greater than 2 kilometres. (Defence).

(d). If the whole of the ground in front cannot be kept under fire from the covered positions, it may be necessary now and then to place part of the artillery in the open. (On the 13th, 14th, and 15th July, dead ground was left, in which the Japanese were able to advance).

(e). If the near defence is not secured, and the enemy is expected to attack, the artillery must occupy open positions. (17th July).

The statistics of the shooting from covered positions in the Russo-Japanese war

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is certainly instructive. Gobjato says that he had to fire in the open oftener than under cover, in spite of the fact that from the beginning of the war he followed the principle "that quick-firing artillery must occupy covered positions." Open positions:—

17th July, 1st, 2nd, 5th, 6th, 7th, 8th and 9th August—a fresh position every day.

Covered Positions:—

13th May, 13th, 14th, and 15th July.

Certainly if telephones had been available, the firing on the 5th, 6th and 7th August, would have been carried out from covered positions, and the numbers would have been (in Gobjato's case):—

Seven cases of firing from covered positions

Five cases of firing from open positions.

Russian Artillery Journal.

PRECIS OF CONTENTS,

AUGUST, 1907.

By LIEUTENANT E. CLAYTON, R.G.A.

1. Firing at a balloon.

Going into details of obtaining range and fuze by means of "Field Calculator," whether the balloon be captive or free, visible or not from the battery.

2. Aubrey's Mekometer and its use in the field.

Dealing with the methods of calculating ranges and angles of sight, also to intervening objects.

3. The rôle of Q.F. shielded artillery in attack and defence. Translated from the German "International Review of Armies and Navies."

The author, lays great stress on the principle that artillery must at all times regardless of their own losses, engage those targets which are most dangerous and present the greatest obstacles to their own infantry.

Fire alone cannot decide a battle, only the advance of the infantry and the use of the bayonet can do so.

4. The defence of Coast Fortresses and Harbours (Part I).

The author adduces many examples from the naval fights off Port Arthur and Tsushima to show the enormous destruction caused by the Japanese high explosive shell on the Russian ships and the feeble effect of the armour piercing shell with very small bursting charge and delayed fuze (percussion), which was so unsensitive that it failed to go off, after piercing unarmoured portions of the ship.

He urges that the high explosive shell shall form the greater part of the ammunition supply, with a less quantity of semi armour piercing shell with high explosive charges and short delayed fuzes. All guns to be Q.F. and provided with visual sights.

5. The mobile artillery repair shop in the Russo-Japanese war of 1904-05.

An account of its doings at the front and list of all the repairs and conversions executed by it, by its commander.

6. Is the decomposition of the explosive gases of nitric acid possible under the action of mouldiness and fungi?

A technical disquisition in chemistry to show that damp nitroglycerine and nitrocellulose should not be packed in paper or fabric or kept in unlined wooden boxes.

7. Notes on technical questions.

(i). A project for a new long gun for siege artillery to fire shrapnel at long ranges. By Lieut. Berger, German Artillery.

(ii). Visual sight for the German 10 and 15 cm. guns.

10. Extracts from the Journals of the Artillery Committee, April, 1907.

Referring to trials and reports of new buffers, wheels, horse collars, unserviceable shell, cartridges and minor questions: including remarks on the practice of the field artillery of the Empire for the year 1906.

The chief characteristics are:—

Proneness to use concealed positions too often. Due to recent introduction of Goniometer which all ranks were greatly interested in.

Neglect of studying the tactical situation during practice.

Notes on an abbreviated system of semaphore signalling for the field artillery.

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"Journal des Sciences Militaires."

PRECIS OF CONTENTS.

By LIEUTENANT C. O. C. HUNT, R.F.A.

November, 1907.

The defence of the kingdom of Naples in 1806.

A Napoleonic study on the disposition of troops; by Col. C. de Grandprey.

Organisation of the colonies and the colonial army; by Capt. Sorb.

The soldier of the revolution.

A study in practical military sociology. Chapter VI. The revolutionary discipline (to be continued); by Lieut. J. Diez.

M.I. with cavalry and in advance of armies (to be continued; by Capt. Besset.

The war of the Austrian succession (1740-1748).

The campaign in Alsace 1744.

Military preparations of the belligerents (to be continued); Major Z.

Some thoughts on the Russo-Japanese war. Part II. Strategy (concluded).

The siege of Port Arthur; by General Baron de Heusch, Belgian army.

Military notes of the month. Nothing of special interest.

December, 1907.

The requisites for a thorough state of preparation; by Capt. Sorb.

The soldiers comfort and the field canteen. M.F.B.

The soldiers of the revolution.

A study of practical military sociology.

Militarism and the civil power. Lieut. J. Diez.

The tactical employment of machine guns. Lieut. Aubert.

Military pedagogy. Part II. (conclusion). Lieut. E.M.

Examination for admission to the French Staff College in 1908.

The tactical question, with solution.

Military notes of the month.

Questions of Artillery tactics.

Exemplified by the history of the Russo-Japanese war. II. Colonel Biélaieff's.

Chapter III. The range of artillery fire.

Examples of artillery fire at short ranges.

The defensive tactics of the Russians and the prudence displayed by the Japanese artillery under the Russian gun fire, inevitably resulted in there being only a very limited number of engagements in which artillery accompanied the assulting columns and took up position at close range. Consequently Russian artillery fire at short range was principally at Japanese infantry advancing; these occasions were not infrequent and even "case" was often used.

Lieut.-Col. Lomikovski in his report says:—

"During the whole campaign the Russians acted upon the defensive, and hardly even took the initiative; thus nearly all the engagements became contests for position, so that there was no opportunity of advancing the guns in support of the infantry. In spite of all the activity on the part of the Japanese, and although they always acted on the offensive, their artillery rarely changed position."

In a general way, in view of the power of modern artillery, and its long range shrapnel fire, it no longer often requires to change position. This opinion is based on the fact that under modern conditions a most careful reconnaissance is necessary before artillery can be placed in position under cover; and this is rarely practical in the heat of battle, and that preparation for opening fire consumes a certain amount of time; the batteries meanwhile cannot act."

"Coming into action in the open in the hostile infantry's zone of fire, is very seldom possible; personnel and horses would be put "hors de combat" before the battery could open fire."

"Nevertheless the ranges are at times very small in some of the engagements on the Sha-ho, fire was opened at the first round with "case." During the night the enemy's sharpshooters had established themselves so close to the position that at dawn they had to be driven off, at all costs."

"In support of the infantry, or to repulse a hostile attack when artillery occupies emplacements under cover recourse was sometimes had to the installation of some sections of artillery immediately in rear of the crest, so that they, not being themselves engaged in the artillery fight, might be rapidly brought up to the crest in the moment of need and open as hot a fire as possible upon the hostile infantry."

"Examples, however, may be adduced of Russian batteries coming into action at short ranges in support of infantry."

It is difficult to draw sound general conclusions from isolated instances; besides, that these may be quite certain, all the circumstances must be known, which knowledge we do not possess. Nevertheless it is apparent that in each of the cases mentioned, the battery's coming into action at short range has succeeded

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in itself, in spite of the enemy's (gun and rifle) fire: perhaps with better co-operation between the different arms, as well as of other batteries, this coming into action might have been attended with still happier results.

To sum up then, artillery should be able to fire at extreme range, but always endeavour to act at decisive range.

I. Q.F. artillery to carry out its principal missions in the fight should take up a position in the zone of decisive shrapnel fire (3,200—4,600 yards), and strive to rapidly attain decisive results, while avoiding being itself drawn into protracted artillery duels at extreme range. Artillery action at long ranges is, as a rule, generally ineffective and leads to a useless waste of ammunition.

This must not of course be taken to imply that artillery should blindly limit itself to the short ranges applicable in each particular case. The principle only is indicated, of the necessity of rapidly attaining decisive results. But an irrational application of this principle may at times lead to a useless suicide of the batteries.

Nor, on the other hand, must the preceding be taken to infer the uselessness of training artillery to fire at long ranges. Such practice is necessary, if only for the fact that in these practices, presenting difficulty in the matter of technique, artillery may best learn to rapidly and surely obtain the results of it; having learnt to shoot well in difficult circumstances, it will be able to shoot with effect when conditions are more favourable. Lastly firing at long range is tactically necessary as already shown.

II. Cases of a rational use of fire at long range i.e. those approaching the effective limit of shrapnel fire, will constitute the exceptions from a tactical point of view in most of the situations in which artillery will have to act.

III. Special tactical missions or particular circumstances may compel artillery to act at long range,even up to extreme range. But this use of artillery must be considered as a necessary evil of a temporary nature and as a means to the carrying out its principle mission at decisive shrapnel range.

IV. Changes of position are no less necessary for modern day artillery than for that of the past: and if such a change to a second position, to carry a specified mission, may not appear necessary for modern Q.F. artillery (formerly it was most often indispensable), yet it is none the less so, if artillery is thereby enabled to perform fresh missions. In refusing to change position (even with due regard to the destructive effects of modern fire), artillery at the same time renounces the use of its mobility, its power of putting certain portions of the battlefield under fire (a means of discounting an enemy's superiority in guns), and its suitability for concentrating the fire of a great many batteries. This successive action of artillery on different points (action of mobile artillery in mass) is easier of realisation by virtue of the increase of effective range, the larger extent of the modern battlefield in breadth and depth, and the protracted duration of engagements. The greater fire effect has made it more difficult, but at the same time more valuable and necessary. Modern artillery, neither more nor less, than its predecessor, requires mobility and capability of manœuvre. "In war mobility and activity are transmuted into power."

If in many of the Manchurian battles, where the Russian artillery was out numbered by the Japanese, the former had possessed this "mobile mass," a true artillery reserve, in the full sense of the term, the issue of many fights would have been different.

V. In the zone of musketry fire, artillery, as before, ought, and can take position with those batteries detailed specially to accompany or support the infantry, or to repulse an attack.

When mountain batteries are available, the task of accompanying or supporting the infantry should be entrusted to them for choice; in certain cases machine guns are eminently suitable.

But F.A. cannot refuse to fulfil this, in spite of increased effect of fire; and must remember that its help, by reason of the power of its weapon has become more useful because of the increased efficiency of musketry fire; and more than ever necessary.

If the doing of the Russian artillery in the Far East do not at first sight bear out these conclusions, the reason must be sought for in special and local causes as:—

1. Differences in equipment of the opposing artilleries.
2. Peculiarities of the theatre of war (ground).
3. The character of the war of position. during the latter part of the campaign.
4. Insufficient organisation of the action of the larger masses of artillery; and insufficient co-operation between artillery and infantry; want of agreement between them; insufficient knowledge on the part of the higher commanders, of the powers and use of artillery.

(To be continued).

Some ideas on the Russo-Japanese war.
Chapter II. Strategy (concluded).
The battle of Sandepoo.
The battle of Mukden. By Gen. Baron W. de Heusch, (Belgian army).

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Conclusions drawn from the Siege of Port Arthur.

By the German General Staff.

A Précis from "Rivista di Artiglieria e di Genio," June, 1907.

By LIEUTENANT H. DE WATTEVILLE, R.G.A.

The attack was commenced with insufficient means.

At first the besieging army was little superior in infantry to that of the besieged. Only in November after the arrival of the 7th division did the reinforcements suffice to do more than fill up gaps. The siege artillery did not possess sufficient strength until October. Though the Russian artillery was partly antiquated the Japanese guns had too many tasks—

(1). To destroy the Russian armament.

(2). To support its own infantry.

(3). To prepare the works for assault.

The insufficient means of the Japanese for a frontal attack on a naturally very strong position must be borne in mind when any deductions are to be drawn from Port Arthur.

The siege does not answer the question as to whether the defender must hold outlying ground. The Kween Tung Peninsula was so eminently favourable to the defence, that it could not be overlooked by an energetic defender. But the fighting in June and July proved that the occupation of extended positions, which cannot be supported by the fortress guns, will not alone suffice for holding outlying ground. The Russians only held their ground to the end of July owing to the weakness of the Japanese.

On the other hand *the occupation of advanced positions within range of the fortress guns proved of great service.* The Taku-Shan positions and those on the N.E. and N.W. of the fortress entailed regular works before being taken.

The attempt at storm failed simply because the necessary conditions for success were lacking. Nevertheless had greater means been brought into play the attack between redoubts No. 1 and 2 might have succeeded. The regular siege proceeded slowly owing to lack of means on the attacker's part. Hand grenades and such improvisations were effective under these conditions.

The assault of a fortress with insufficient artillery must lead to many failures and heavy loss. The Japanese artillery had no effect on the concrete caponiers. Heavier ordnance and more ammunition should have been used. Where artillery partly or wholly fails to destroy these caponiers in a short space of time, this becomes the task of the engineers as happened at Port Arthur. The 11" mortars only here and there were able to pierce the bomb proof vaults of the concrete barracks. The destruction of such shelters becomes necessary where they cannot be turned. Even after the destruction of the caponiers, the Russians were still safe in the strong shelters of their central works and able to rush out when attacked.

The employment of the Japanese artillery did not correspond to modern principles. There was no attempt at obtaining or maintaining a superiority of fire over the hostile guns, but the fire was scattered over the harbour, and town, and the hostile positions. Thus fire was also directed at the points of attack without consideration of possible hostile frontal or enfilade fire. The latter caused heavy loss among the assailants, later an attempt was made to overcome the entire defending artillery, but this failed partially, perhaps owing to the difficulties of ammunition supply.

The grouping of the defender's positions in depth was successful. It was favoured by the formation of the ground; thus nearly every work was supported by others standing further back or the flanks. The Japanese were thus compelled to adopt frontal attacks, which in many cases were finally met by successful counter attacks.

Machine guns are of great assistance to the defence. The effect of their flanking fire is considerable.

Secondary defences except barbed wire entanglements did not prove of very great value. Here and there fougasses met with success, but such devices as high tension electric wires were of little use.

Mining was not carried out according to generally accepted ideas. The Japanese owing to the nature of the ground only began mining when the infantry had reached the crest of the glacis. Vertical shafts were then alone required to destroy the caponiers. Much surprise was aroused by the Japanese mining the ramparts of the warks. This was rendered necessary by the weakness of the Japanese artillery, which failed to destroy the solidly built shelters of the hostile works.

A regular subterranean warfare was carried on, but the Russian countermines only delayed the enemy's progress. Such procedure should be unnecessary where the attack possesses sufficient artillery and infantry storming columns.

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The starting point for the assaults were much nearer to the defender than had hitherto been considered the rule. The distance was often less than 100 yards; sometimes as little as 30 yards. The points of attack were heavily shelled by artillery with but apparently small results. This could not be possible in every case should high explosive projectiles be used.

The Russians attempted no grand sorties although the conditions were favourable to them. Small sorties often met with success.

The siege was a necessity for the Japanese. The command of the sea, indispensable to them, demanded the destruction of the Russian ships sheltered in this harbour of Port Arthur.

Revue de l'Armée Belge.

Précis of Contents.

By LIEUTENANT K. B. FERGUSON, R.G.A.

July—August, 1907.

1. Bremer automatic electric targets. An illustrated description of an automatic target which is intended for the same purpose as the American sub-target. The latter is already well known in this country; the Bremer target is apparently an improvement, because it is claimed that it can be used with any kind of target, at any range, and with any pattern of firearm and ammunition. The effect produced is the same. The marksman, as soon as his projectile hits the target, sees marked on a reduced facsimile of the target beside him the exact spot where he hit.

2. Some lessons for artillery from the Russo-Japanese war; by Capitaine-Commandant A. Hellebaut. The continuation of an article which was noticed in our last précis. The author deals with the vexed question, how far artillery should support infantry advancing to the attack; with the employment of artillery with the advanced guard and main body respectively; with artillery duels before an engagement; with artillery in pursuit and retreat; and with the employment of Horse artillery with cavalry in action.

3. A study in musketry; by Capitaine Bisman. Continued from preceding numbers. The author goes into elaborate calculations of the corrections to be made for wind, and for travel of target.

4. Lectures on the military education of young officers; by Colonel A. Keucker. The first instalment of a series of lectures which the author says he will group under five headings:—

(1). On the influence of moral forces in war.

(2). On the military qualities young officers must acquire to fit themselves for command.

(3). and (4). On the duties of an officer in instructing and educating his men.

(5). On the social position and duties of officers.

5. Gun carriages with displacement: their construction, mechanical theory, and efficiency (continued). A further instalment of Capitaine Collon's learned treatise on the above subject, already noticed in previous précis.

6. Notes on foreign armies, notices of books, etc. Among the latter is a review of Colonel Rouquerol's much discussed new work on "Artillery in the battle of August 18th. (Gravelotte)."

September—October, 1907.

1. Lectures on the military education of young officers; by Colonel A. Keucker. (Continued from the last number of the Revue).

In this instalment the author deals with the duties and responsibilities of officers, somewhat from the point of view of an idealist, pointing out the position of the army as an educational centre in the nation, analysing and extolling the virtues of patriotism, of obedience, and a strong sense of duty, etc. These lectures were evidently addressed to, or intended for young officers on the threshold of their military career.

2. A study in musketry; by Captaine

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Bisman. (Continued from previous numbers, and now concluded).

In this series of articles the author has been working out the relative fire effect to be expected in the field against troops in various formations and at various ranges, illustrating his theories by problems and diagrams. He now sums up his conclusions, and also discusses the bearing of the moral factor on his subject.

3. The use and tactics of machine guns (Mitrailleuses) on the battlefield; by Lt. v. Noel. (To be continued.)

The author points out that the mitrailleuses, which have fallen into comparative discredit on the Continent in the course of the last thirty years, has powerfully reasserted its value in the Russo-Japanese war, and he prophecies a brilliant future for it.

These articles are to be divided into six parts:—

(1). General remarks. (2). Nature and characteristics of machine guns. (3). Means of transport and gun carriages. (4). Various opinions on the tactical employment of machine guns. (5). Tactical employment in attack and in defence. (6). Organisation; allotment to units; general conclusions.

In the present article,—Chapter I.—the author reviews the application of machine guns in warfare since the Franco-German war, and briefly discusses the use made of them in modern armies.

(4). Gun carriages with displacement: their construction, mechanical theory, and efficiency (continued). A further instalment of Captaine Collon's learned treatise on the above subject, already noticed in previous précis.

(5). The new German rifle bullets, manufactured in the arsenals at Berlin and Karlsruhe.

An exhaustive description giving full details of size, weight, ballistics, penetration, etc., in the text of the article, in tables at the end of it, and in photographic plates.

(6). Notes and information on various subjects; reviews of books, etc.

The "Spectateur Militaire."

Précis of Contents.

By MAJOR E. P. SMITH, R.F.A.

15th October, 1907.

Some lessons of the sad experience of the Russo-Japanese war.

I. How can the strength of Japan and the weakness of Russia be accounted for?

II. The characteristic traits of our strategy (to be continued); by General Martynov of the Russian General Staff.

The Channel Tunnel.

Its influence on the safety of France and Great Britain.

Chapter VIII. From the negative to the positive. Commerce and war. Maritime traffic and the submarine tunnel. Great Britian and the world. The submarine tunnel a new element of British military strength (to be continued); by G. Viernot, General Staff.

The penetration into the Sahara 1899-1905.

I. Summary description. Orography. Populations. The Occupation. The Flamand mission. The d'Eu column. The Bertrand, Letulle and Menestrel columns (to be continued); by Lieut. Bagney, 50th Infantry.

Study of the different systems of military colonisation carried out in France and abroad; by Capt. Condamy, Colonial Infantry.

Russian military colonisation.

An International garrison.

Chapter XII. Conclusion; by Iani Jikalis.

1st November, 1907.

Some lessons of the sad experiences of the Russo-Japanese war.

III. Influence of the fleet's operations on the progress of the Continental war.

IV. The personnel of the Commander-in-Chief's staff.

V. The officers (to be continued); by General Martynov, Russian General Staff.

The Channel Tunnel.

Its influence on the safety of France and Great Britain.

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Chapter IX. The French point of view. The problem for France and England is identical. The necessary and sufficient precautions. Identity of English and French interests. Objections to the present project. The approaches and exits of the tunnel both on the French and English side must be covered from attack by a fleet. The neutrality of the tunnel.

Chapter X. Conclusion. The tunnel must: it will be made. By G. Viernot, General Staff.

The penetration into Sahara, 1899-1905 (to be continued); by Lieut. Bagney.

Study of the different systems of military colonisation.

Military colonisation of Algeria (to be continued); by Lieut. Blagney.

15th November, 1907

Some lessons of the sad experience of the Russo-Japanese war.

Chapter VI. The soldier (to be continued); by General Martynov, Russian General Staff.

The penetration into Sahara, 1899-1905.

Conclusion. The Saharan companies; by Lieut. Bagney, 50th Infantry.

Study of the different systems of military colonisation tried in France and abroad.

Military villages. Marshal Bugeand's plans (to be continued); by Captain Condamy.

Machine guns abroad and in France.

Their development, organisation and employment.

Historical. Present day patterns. Machine guns as used by the Great Powers. Tactical use. Different methods of fire (to be continued); by Lieut. Boullé.

1st December, 1907.

Some lessons of the sad experience of the Russo-Japanese war.

VII. Tactics (to be continued); by General Martynov, Russian General Staff.

Observations of an old foot-soldier on the northern manœuvres.

I. The management of manœuvres.

II. Manœuvres themselves.

III. Field service.

IV. Different questions.

V. The lower grades of N.C. Officers.

Study of the different systems of military colonisation tried in France and abroad.

Military colonisation at Madagascar.

Native Military colonisation (to be continued); by Capt. Condamy, Colonial infantry.

Machine guns abroad and in France.

Their use, development, and organisation. Tactical use of machine guns in recent wars. In future warfare. Advancing under machine gun fire. Strength of machine gun detachments. The officer in command of the section. Conclusion. By Lieut. Boulle.

15th December, 1907.

Realistics of the battle.

Failures, acts of heroriem, panics.

Conferences for officers.

1st Conference.

The Psychology of the battle. Failures and heroic acts.

Introduction.

An episode of 1870. Colonel Ardent du Pieq. Some military writers. Object of the conference.

The principal phases of the battle.

Before the engagement. Impressions of Skobeloff. The advance. Attraction of cover. The 11th Prussian brigade at Regonville (1870). The bayonet attack.

Fear:—

The opinions of de Ligne, Skobeleff and Hohenlohe. How it shows itself. Fear is not cowardice. Experiences of various authorities (to be continued); by General Daudignac.

Some lessons of the sad experience of the Russo-Japanese war.

VIII. The Russian Staff College. The personnel of the Staff. Rewards (to be continued); by General Martynov, Russian Staff.

Study of the different systems of military colonisation in France and abroad.

The rôle of the army in the colonies. Résumé and conclusion (to be continued); by Capt. Condamy, Colonial Infantry.

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VOL. XXXIV. No. 1. APRIL, 1907.

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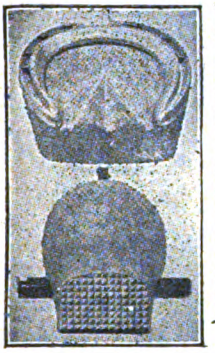

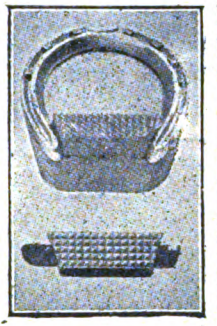

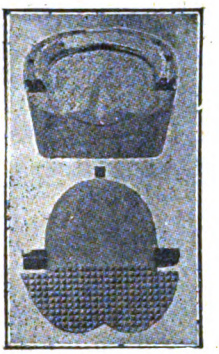

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" W. K. Bourne, Indian Army.
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DECEMBER, 1905.

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16th	R. Crofton	[illegible]	
45th	D. Stephenson	[illegible]	
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A. E. Hardy	2,304	W. F. Anderson	[illegible]
N. H. Hutcheson	2,105	D. C. Robinson	[illegible]
F. D. Frost*	1,949	F. A. Bowring	[illegible]

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The following passed:—

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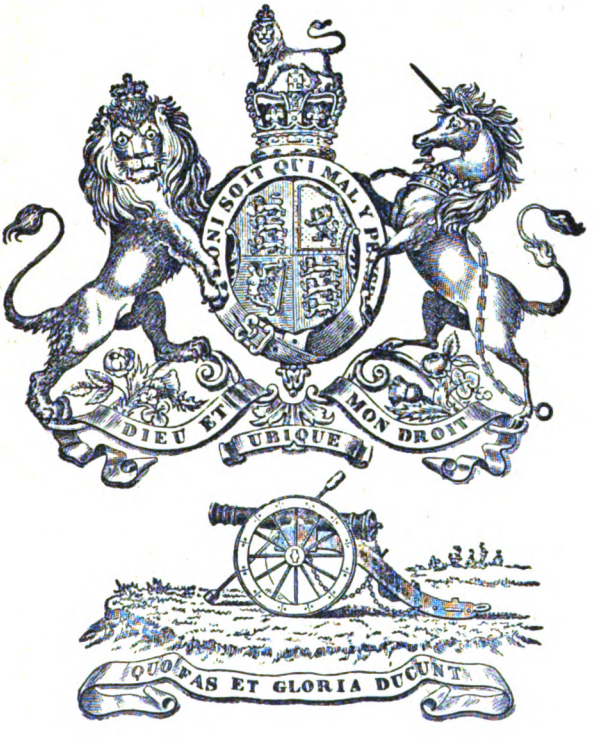

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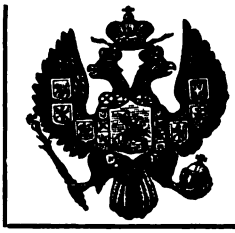

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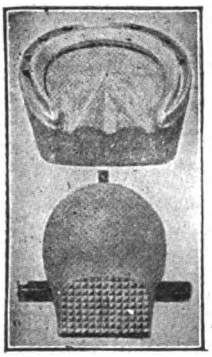

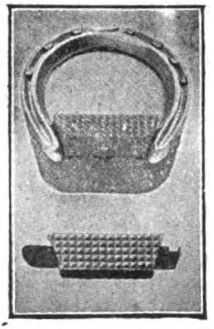

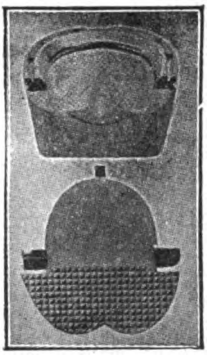

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5. Pads receive all concussion, jar, and wear, so saving the horse.
6. **May be used only when required.**
7. Wear longer than ordinary pads which are nailed on with the shoes, as they should be taken out in the stable, thus adding to their life, and also prevent decomposition of the horses' feet, caused by accumulation of filth and heat, chiefly gathered when in the stable.
8. Specially **suited for all riding horses,** including **hunters, polo ponies, and racehorses,** to prevent slipping in bad weather and as a preventative of jar on baked ground (light strip pads, attachable to the heels of shoes, supplied for these classes of horses, which fit quite close to hoof). The pad is narrow in shape, which does not produce suction even in deep going.
9. Not more expensive than ordinary pneumatic pads, with double their advantages, and without any of their disadvantages.
10. **Impossible for any of them to become detached except by hand.**
11. Absolutely **sanitary** and **effective.**
12. The only perfect and detachable pads on the market.

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Yon can send the others that are ordered when ready.—Yours faithfully,

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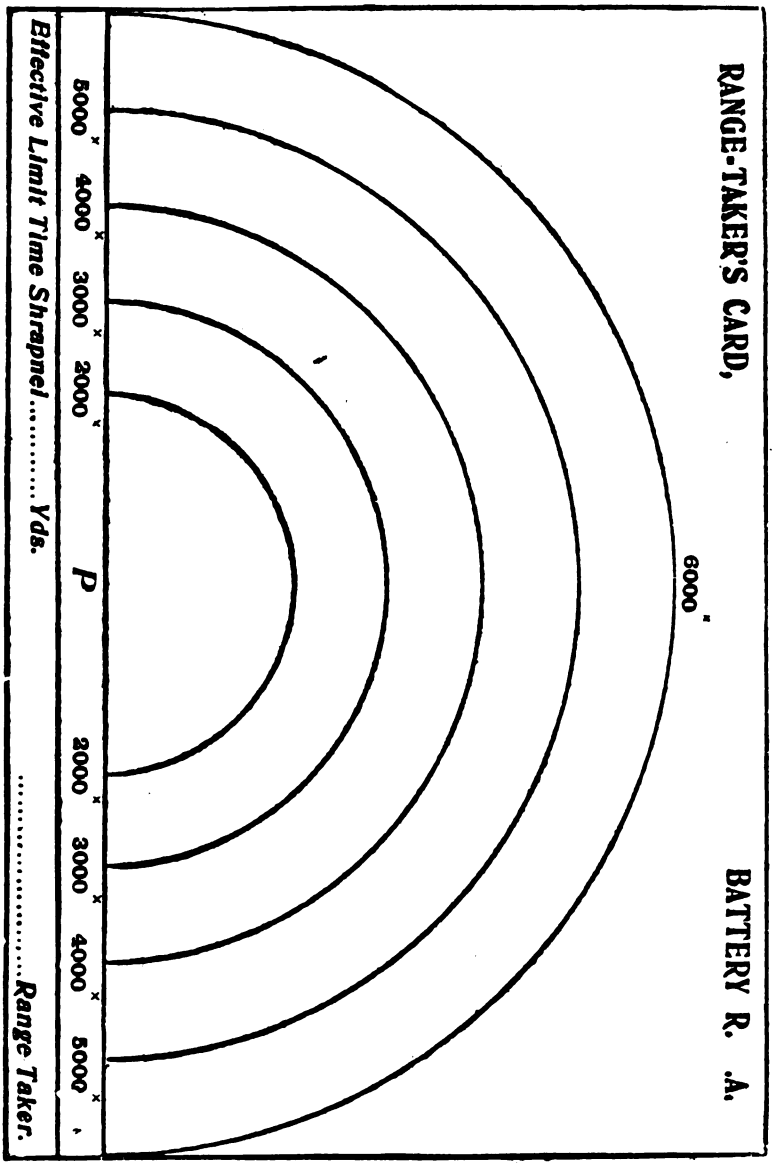

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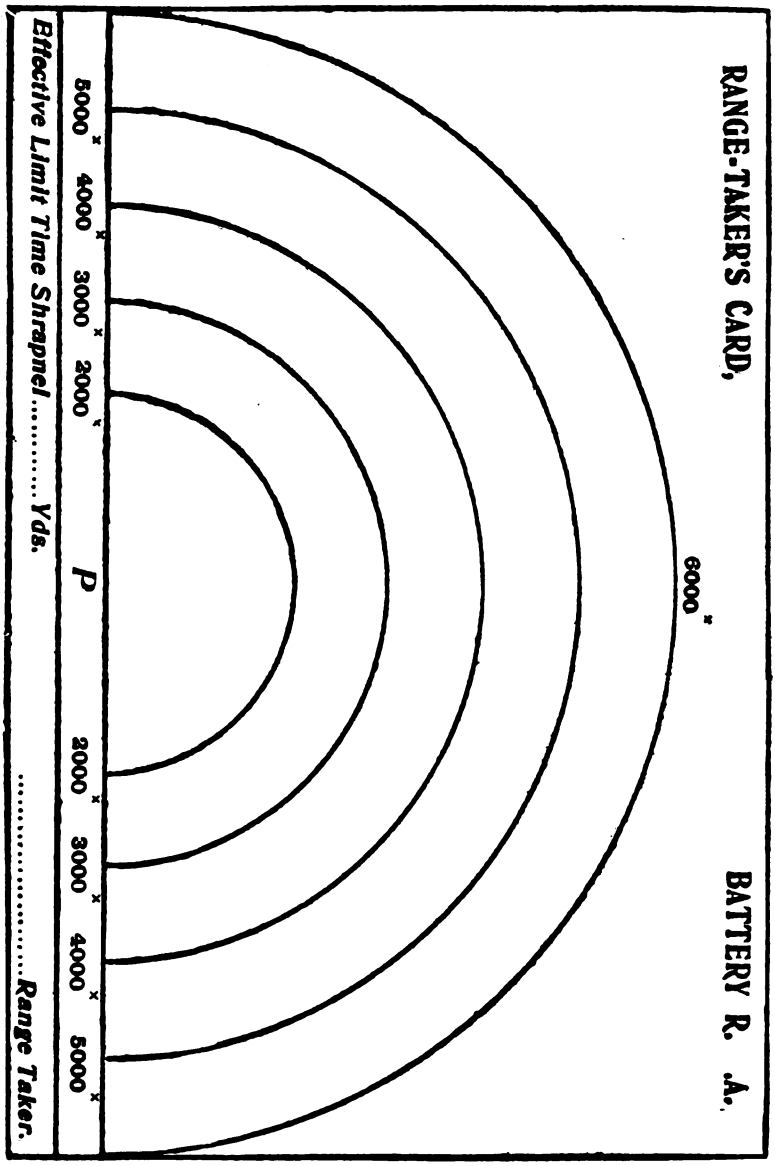

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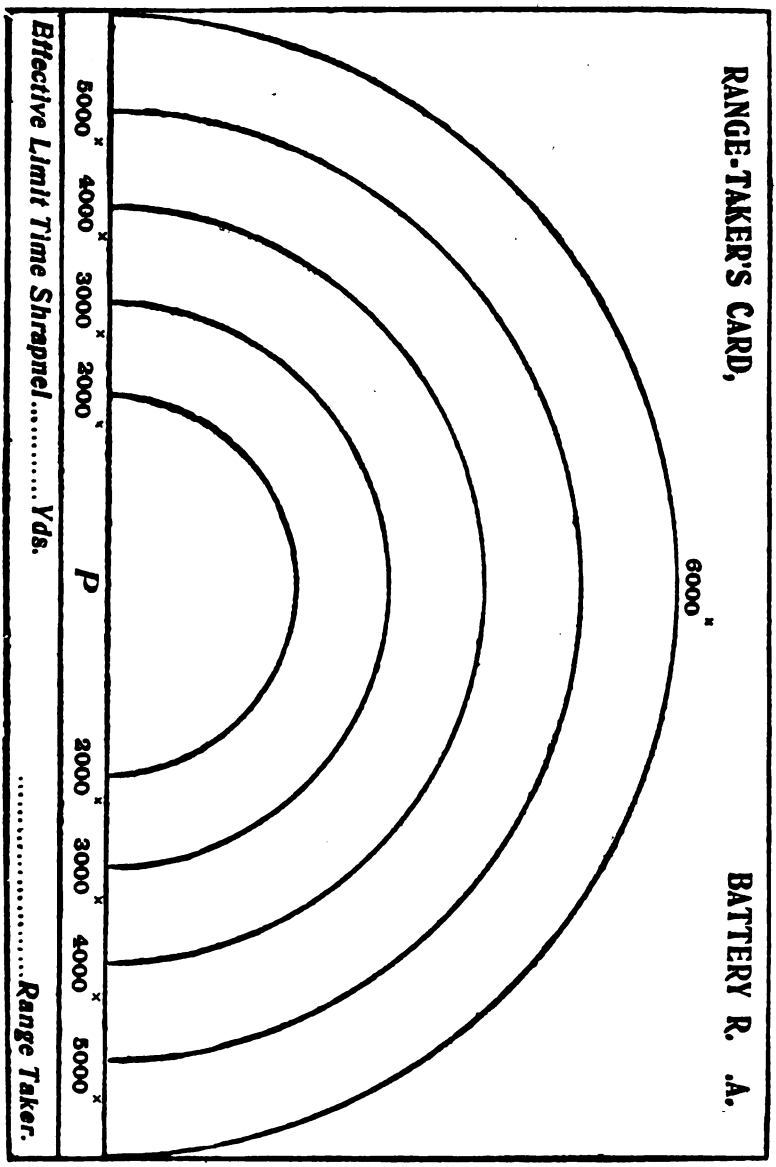

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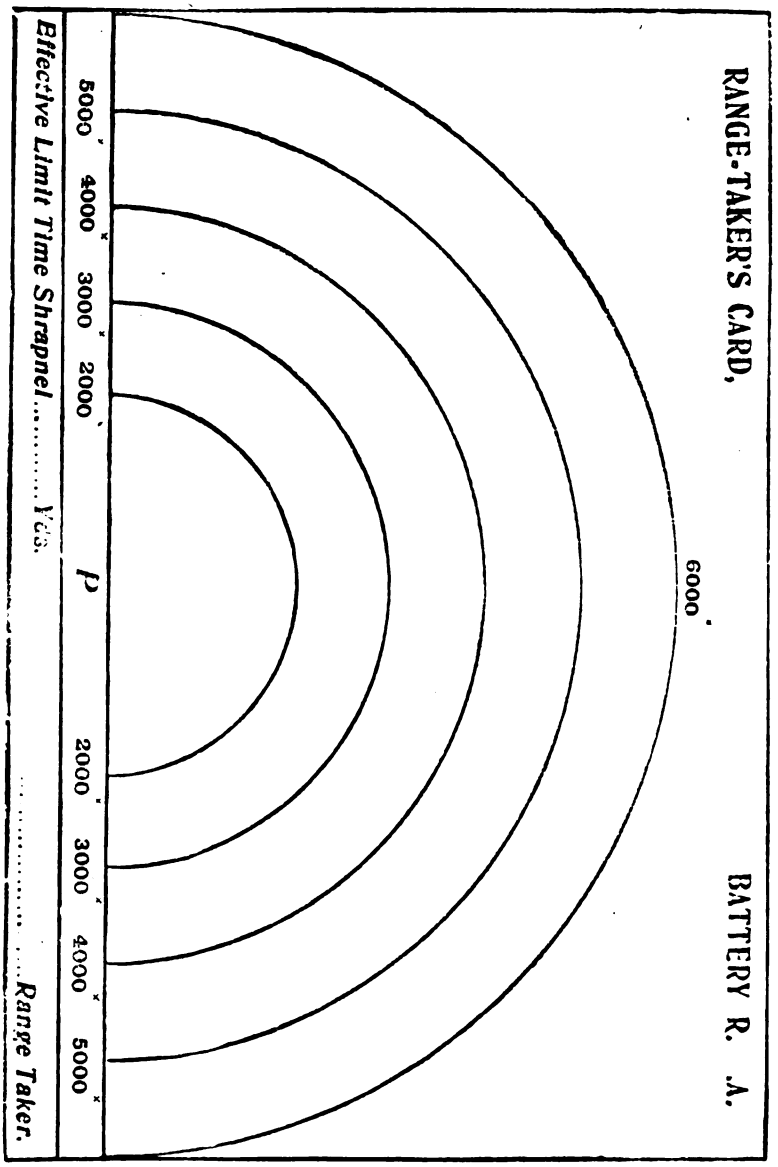

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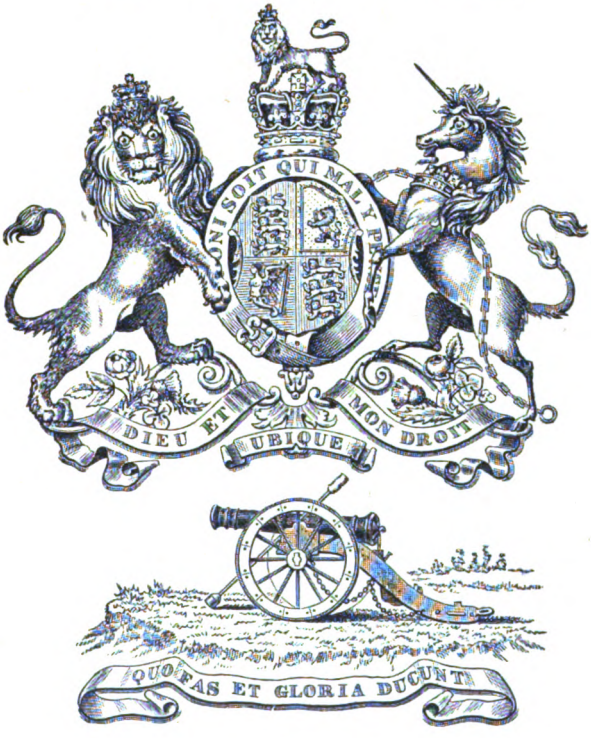

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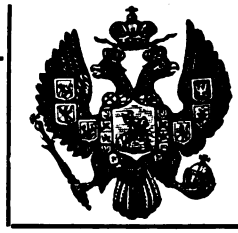

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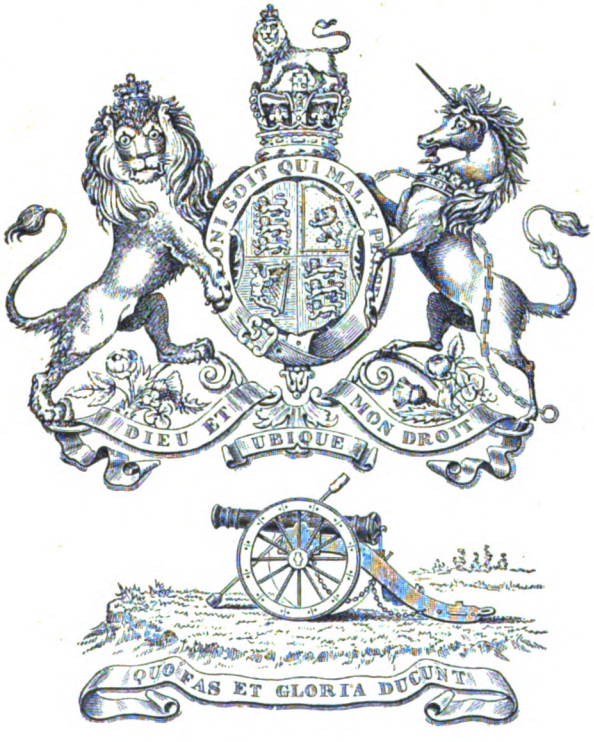

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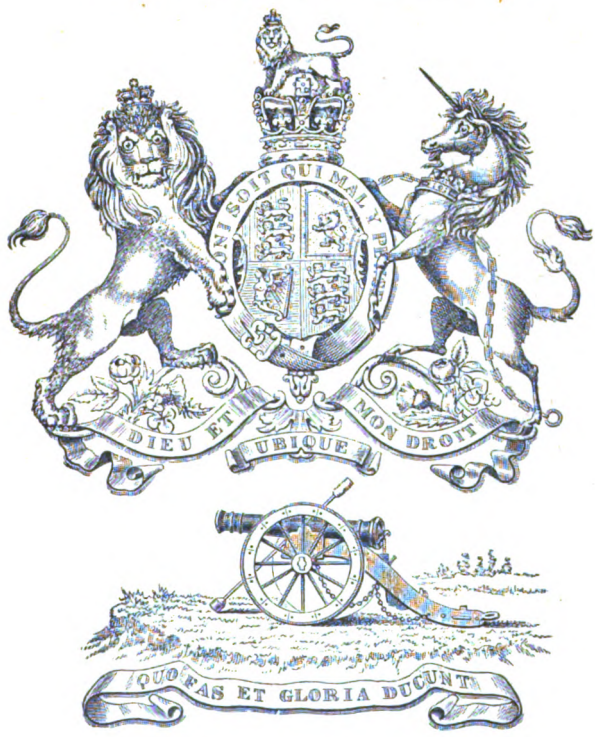

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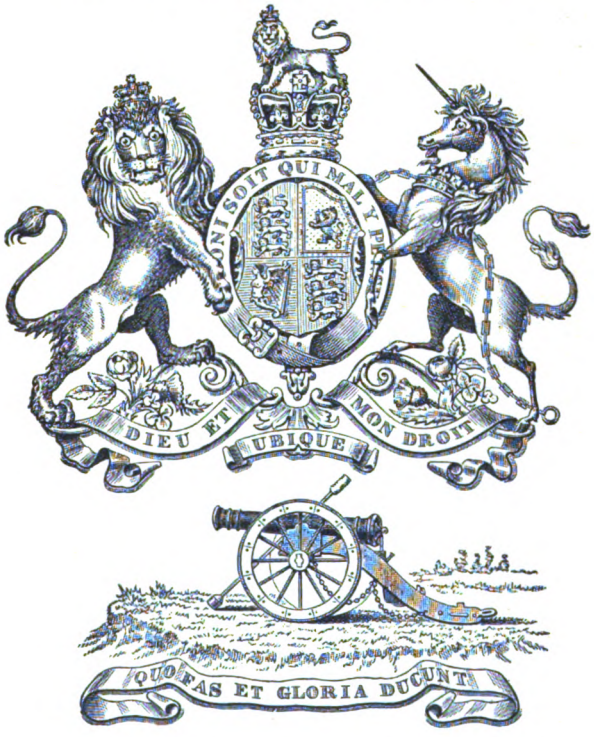

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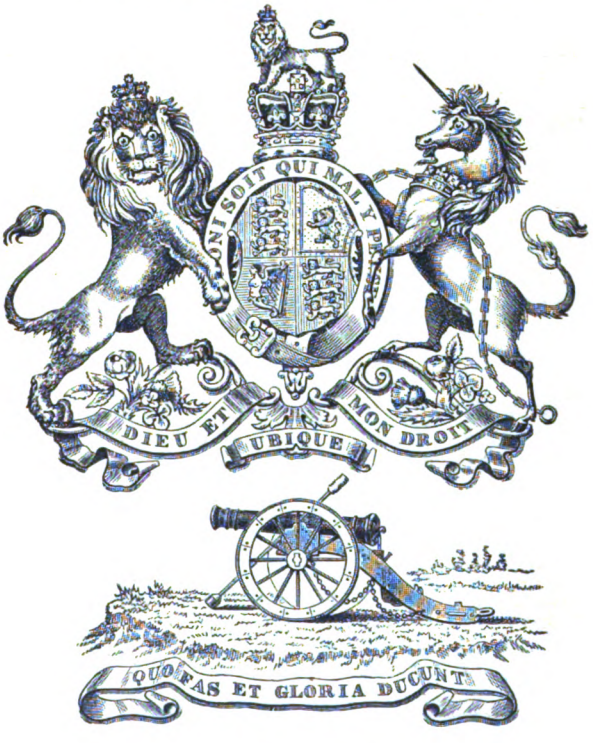

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